ISSN 1997-9347

Components of Scientific and Technological Progress

SCIENTIFIC AND PRACTICAL JOURNAL

№ 2(36) 2018

Paphos, Cyprus, 2018

ADVISORY COUNCIL

Tyutyunnik V.M. – Doctor of Technical Sciences, Candidate of Chemical Sciences, Professor, Director of Tambov branch of Moscow State University of Culture and Arts, President of the International Information Center for Nobel Prize, Academy of Natural Sciences, tel.: 8(4752)504600, E-mail: vmt@tmb.ru, Tambov (Russia)

Bednarzhevsky S.S. – Doctor of Technical Sciences, Professor, Head of Department of Safety, Surgut State University, laureate of State Prize in Science and Technology, Academy of Natural Sciences and the International Energy Academy, tel.: 8(3462)762812, E-mail: sbed@mail.ru, Russia

Voronkova O.V. – Doctor of Economics, Professor, Corresponding Member of the Academy of Natural Sciences, tel.: 8(981)9720993, E-mail: voronkova@tambov-konfcentr.ru, St. Petersburg (Russia)

Omar Larouk – PhD, Associate Professor, National School of Information Science and Libraries University of Lyon, tel.: +0472444374, E-mail: omar.larouk@enssib.fr, Lyon (France)

Wu Songjie – PhD in Economics, Shandong Normal University, tel.: +86(130)21696101; E-mail: qdwucong@hotmail.com, Shandong (China)

Du Kun – PhD in Economics, Associate Professor, Department of Management and Agriculture, Institute of Cooperation of Qingdao Agrarian University, tel.: 8(960)6671587, E-mail: tambovdu@hotmail.com, China

Andreas Kyriakos Georgiou – Lecturer in Accounting, Department of Business, Accounting & Finance, Frederick University, E-mail: bus.akg@frederick.ac.cy, Limassol (Cyprus)

Petia Tanova – Associate Professor in Economics, Vice-Dean of School of Business and Law, Frederick University, Limassol (Cyprus)

Sanjay Yadav – Doctor of Philology, Doctor of Political Sciences, Head of Department of English, Chairman St. Palus College Science, tel.: 8(964)1304135, Patna, Bihar (India)

Levanova E.A. – PhD, Professor, Department cosocial pedagogy and psychology, Dean of the Faculty of retraining for Applied Psychology, Dean of the Faculty of Pedagogy and Psychology of the Moscow Social and Pedagogical Institute; tel.: 8(495)6074186, 8(495)6074513; E-mail: dekanmospi@mail.ru, Moscow (Russia)

Petrenko S.V. – PhD in Technical Sciences, Associate Professor, Head of Department "Mathematical Methods in Economics", Lipetsk State Pedagogical University, tel.: 8(4742)328436, 8(4742)221983, E-mail: viola@lipetsk.ru, viola349650@yandex.ru, Lipetsk (Russia)

Tarando E.E. – Doctor of Economics, Professor of the Department of Economic Sociology, St. Petersburg State University, tel.: 8(812)2749706, E-mail: elena.tarando@mail.ru, St. Petersburg (Russia)

Pushkareva T.V. – Doctor of Education, Professor, Department of Social Pedagogy and Psychology, Moscow Social and Pedagogical Institute, tel.: 8(495)6074186, 8(495)6074513; E-mail: dekanmospi@mail.ru, Moscow (Russia)

Kochetkova A.I. – Doctor of Philosophy and Cultural Studies (degree in organizational development and organizational behavior), PhD, Professor, Department of General and Strategic Management Institute of Business Administration of the Russian Academy of National Economy and Public Administration under the President of the Russian Federation, E-mail: dak6966@gmail.com, Moscow (Russia)

Bolshakov S.N. – Doctor of Political Sciences, Doctor of Economics, Vice-Rector for Academic Affairs, Professor, Syktyvkar State University named after Pitirim Sorokin, tel.: 8921633 48 32, E-mail: snbolshakov@mail.ru, Syktyvkar (Russia)

Joanna Gocłowska-Bolek – Center for Political Analysis, University of Warsaw, Warsaw (Poland)

Ellada Karakasidou – A&G, Kotanides LTD, Logistic, tel.: +99346270, E-mail: espavoellada9@gmail.com, Paphos (Cyprus)

Journal "Components of Scientific and Technological Progress" is published 4 times a year

Founder
Development Fund for Science and Culture
Scientific news of Cyprus LTD

Chief editor
Vyacheslav Tyutyunnik

Page planner:
Marina Karina

Copy editor:
Natalia Gunina

Director of public relations:
Ellada Karakasidou

Postal address:
1. In Cyprus:
8046 Atalanta court, 302
Papthos, Cyprus
2. In Russia:
70 Moskovskaya St, apt. 5,
Tambov 392000, Russia

Contact phone:
(+357)99-740-463
8(915)678-88-44

E-mail:
tmbprint@gmail.com
jurnal@admin.tstu.ru

Subscription index of Agency **''Rospechat''** No 70728 for periodicals.

Information about published articles is regularly provided to **Russian Science Citation Index** (Contract No 124-04/2011R).

Website:
http://moofrnk.com/

Editorial opinion may be different from the views of the authors. Please, request the editors' permission to reproduce thecontent published in the journal.

CONTENTS

Architecture and Construction

Khanfar Adam, Hussain Safaa Mohammed Ridha Hussain, Nadjari Hossein The Effect of Structure of Porous Materials on Thermal Conductivity 4

Economic Sciences

Abdullah Al Nafis, Guzikova L.A. Volatility Modeling to Build a New Platform for Volatility Trading in Binary Options 10

Kovrova G.N., Shmyreva A.I. The Model to Assess the Relations of a Commercial Bank with Corporate Clients 21

Voronkova O.V. Direction of Digital Economy in the Field of Public Administration of the Russian Federation 26

Pedagogical Sciences

Khachaturova K.R. Theoretical Grounds of Teaching in Adolescence 29

M. Moghaddam Khademi Using Android Applications in Learning the Russian Language in Google Play 32

СОДЕРЖАНИЕ

Архитектура и строительство

Ханфар Адам, Хуссейн Сафаа Мохаммед ридха Хуссейн, Наджари Хоссейн Влияние структуры пористых материалов на теплопроводность 4

Экономические науки

Абдулла аль-Нафис, Гузикова Л.А. Моделирование волатильности для создания новой платформы торговли волатильностью бинарных опционов 10

Коврова Г.Н., Шмырева А.И. Модель оценки взаимодействия коммерческого банка с корпоративными клиентами 21

Воронкова О.В. Направления развития цифровой экономики в сфере государственного управления РФ 26

Педагогические науки

Хачатурова К.Р. Теоретические особенности обучения в подростковом возрасте .. 29

Хадеми Могаддам Мохсен Али Использование андроид-приложений для изучения русского языка в Google Play 32

UDK 621.452.32

The Effect of Structure of Porous Materials on Thermal Conductivity

Khanfar Adam, Hussain Safaa Mohammed Ridha Hussain, Nadjari Hossein

Samara National Research University, Samara (Russia)

Key words and phrases: compaction; construction; heat dissipation; sealing; leakage.

Abstract: The article reveals the need to determine the range of changes in the parameters of the structure of the porous material, providing effective thermal conductivity for its use as a sealing element. The study determined the maximum effective thermal conductivity of samples depending on their porosity.

The effect of the material structure on the effective thermal conductivity of porous materials was studied experimentally using analytical and digital modeling. The results are presented for different types of porous materials made of stabilized zirconium. Taking into account the methods of development, the presented results are not related to porous structures that have a defined direction of heat flow, that is, with a special shape and direction of the pores.

The results of two analytical models are compared experimentally. Firstly, the model of Hashin and Strickman allows determining the most extreme lower and upper limits of the effective thermal conductivity [1]. Secondly, a percolation model via Landauer expression that takes into account the open porosity character found in the porous structures of our materials [2]. The use of the model of percolation is valid only in thermal conductivity of the two phases and the percentage of porosity; however, we will show that it is possible to include the data associated with the microstructure of materials in the calculations. The digital models were chosen to test the hypotheses about the role of the organization of porous structures and its influence on the efficiency of thermal conductivity. At the end, the conclusions about the development of porous materials will be presented.

To develop a porous material, it is advisable to use a body having a small internal thermal conductivity. Thus, the first materials were developed from stabilized zirconium in which the thermal conductivity is 2 W/(m·K).

Table 1 describes the different characteristics of this sample.

Raghavan showed that the thermal conductivity of zirconia varies with temperature from 300 K to 1000 K on linear dependence of 1/T. This behavior is characterized by diffusion of phonons in the processes of transfer. Thermal conductivity is greatly reduced by the addition of yttrium oxide; this phenomenon is explained by the increase in concentration. The thermal conductivity of stabilized zirconium with yttrium oxide has a temperature-dependent behavior similar to that of an amorphous material, i.e. it is weakly subjected to temperature changes. The thermal conductivity of the samples of zirconium with 8.2 % of the total gram-molecules

Table 1. Main characteristics of porous materials made of stabilized zirconium

Material	Stabilized zirconium
Percentage of porosity	45–73 %
Particle size	60–70 nm
Pore size	10 nm and 1 μm

Table 2. Calculated data of thermal conductivity of a solid material

$\Lambda_{monocrystal}$, W/(m·K)	Average particle size, nm	R^*_{int}, m^2·K/W	λ_{poly}, W/(m·K)
2.3	60–70	$0.5 \cdot 10^{-8}$	1.9

of yttrium oxide was measured by Raghavan, while particle size equal to 150 nm, the thermal conductivity is 2.2 W/(m·K). The thermal conductivity of single crystal Zirconia with yttrium was determined by Bisono et al. With the help of a device for measuring thermal conductivity, the device has a high resolution and uses infrared thermography. For a percentage of 8.3 % molecules-grams of yttrium oxide, the resulting thermal conductivity was 2.3 W/(m·K).

We measured the thermal conductivity of a compressed sample made from powder to develop porous materials. If the particle size is 4 μm, the effect of thermal resistance on the particle compaction can be disregarded. The experimental value obtained was 2.2 W/(m·K), i.e. the difference with the results of Bison and Raghavan was less than 5 %.

The value of thermal conductivity of a solid, necessary for analytical calculations and digital simulation, was calculated on the basis of the value determined by Bison and al. for a single crystal, formula 1–18, to allow for the thermal resistance of the particles. Thus, the resulting value was 1.9 W/(m·K), the calculation data are given in Table 2. The value of thermal resistance of the particles was determined by Yang and al.

Changes in thermal conductivity depending on the number of pores determined experimentally and analytically are shown in fig. 1. Experimental results are restricted to the upper and lower boundaries of the model of the great Hanshin and Shtrikman. They are close to the values calculated by percolation model with pore percentage below 65 %. This similarity can be explained by the phase interpenetrability hypothesis based on the percolation model, which allows a better study of the microstructure of heterogeneous porous material, presenting an open and penetrating porosity. This correspondence can be improved taking into account the microstructure data.

The model developed by Landauer assumes the hypothesis of separation of material into zones of phases 1 and 2 with the same sizes.

Fig. 2 shows the mercury porosity measurement graphs for these samples, distinguishing two groups of pores as shown in Fig. 2a, forming two different networks one for mesopores (pore size from 2 to 50 nm) and the other for macropores pore size greater than 50 nm). Thus it is possible to obtain a more accurate estimate of the effective thermal conductivity using the percolation model, making calculations in two stages as shown in Fig. 2.

First, we calculate the effective thermal conductivity of the mixture formed from the tweordic body and mesopores, and it is noted as λ_{hard} + mesopores. Further, the effective thermal

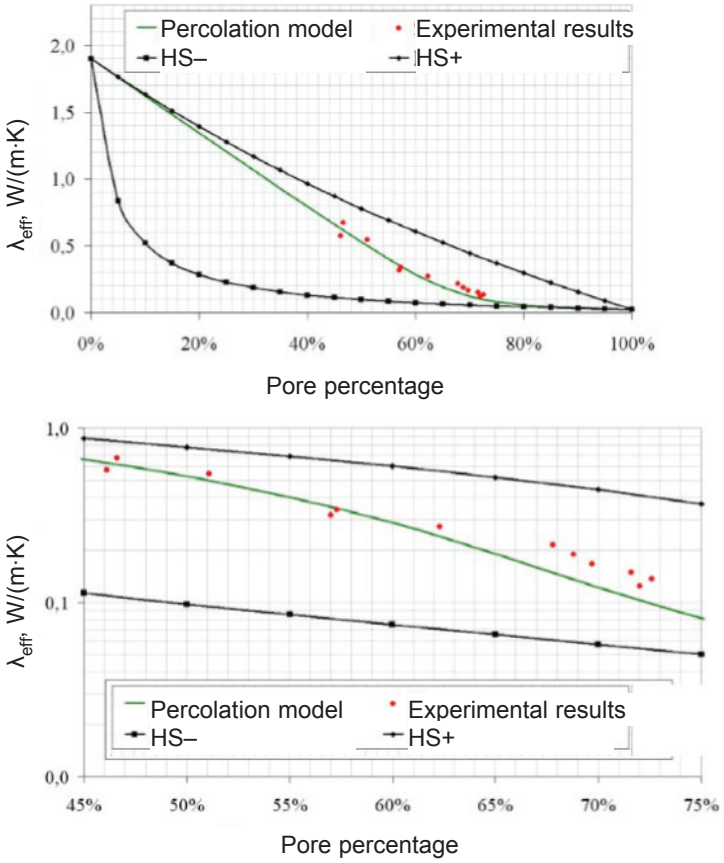

Fig. 1. Effective thermal conductivity as a function of pore percentage for stabilized zirconium samples:
a) linear scale; b) logarithmic scale

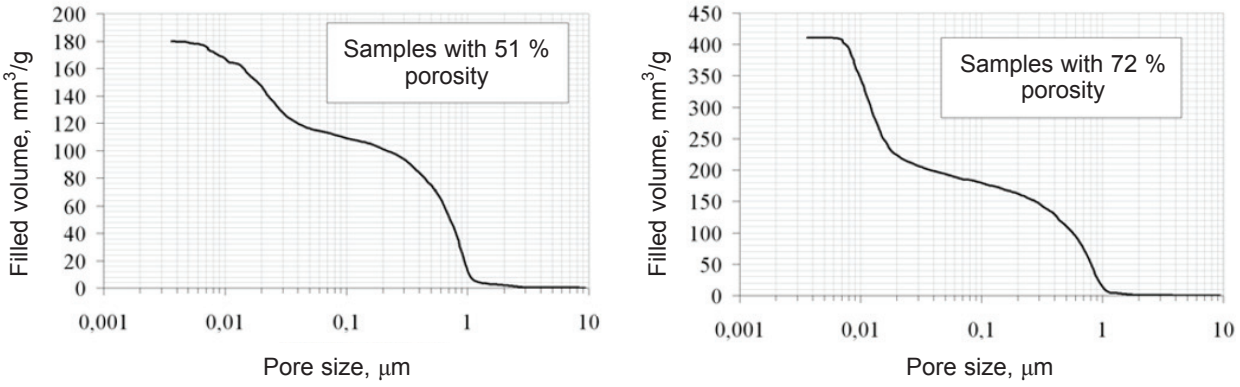

Fig. 2. Measurement of porosity by mercury:
a) samples treated with a temperature of 1070 °C;
b) samples treated with temperatures up to 850 °C

Table 3. Data for calculation of the effective thermal conductivity by Landauer in two stages

Porosity	$\frac{V_{meso}}{V_{meso}+V_{solid}}$	$\Lambda_{solid+mesopore}$, Вт/(m·K)	$\frac{V_{macro}}{V_{meso}+V_{macro}+V_{solid}}$	λ_{eff}, W/(m·K)
72 %	0.59	0.32	0.30	0.19
68 %	0.53	0.46	0.30	0.27
62 %	0.46	0.63	0.31	0.36
57 %	0.38	0.86	0.31	0.48
51 %	0.30	1.08	0.32	0.59

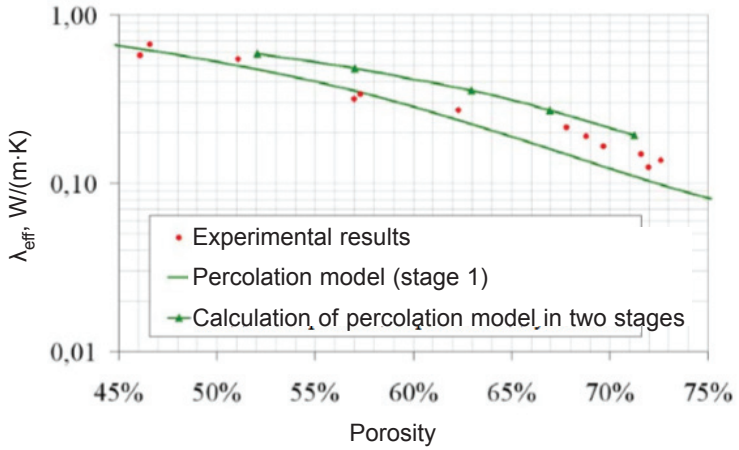

Fig. 3. Effective thermal conductivity depending on the pore percentage for stabilized zirconium samples.
Digital data: λ_s = 1.9 W/(m·K), λ_s = 0.026 W/(m·K)

conductivity of the material is determined using the previously obtained value and taking into account the bulk fraction of macropores. This calculation requires for each sample, the determination of the corresponding volumes occupied by the solid, mesopores and macropores, through the analysis of the graph of measurement of the porosity of mercury. Table 3 presents calculation data for 5 samples.

The values determined by Landauer's expression, taking into account the mutual spreading in pore sizes, are compared with the experimental results as shown in fig. 3. From the analytical point of view, the following conclusion can be made : bimodal (mutual) pore size distribution leads to an increase in the effective thermal conductivity compared to the modal distribution.

The divergence of the experimental results with respect to the assumptions of the percolation model applied in one stage at porosity greater than 65 % can be explained by the presence of two groups of pore sizes.

Based on the percolation theory applied in the case of porous materials, the solid phase is no longer included in the system when the percolation boundary (70 % porosity) is raised. The material loses its mechanical property (hardness). Our materials represent hardness

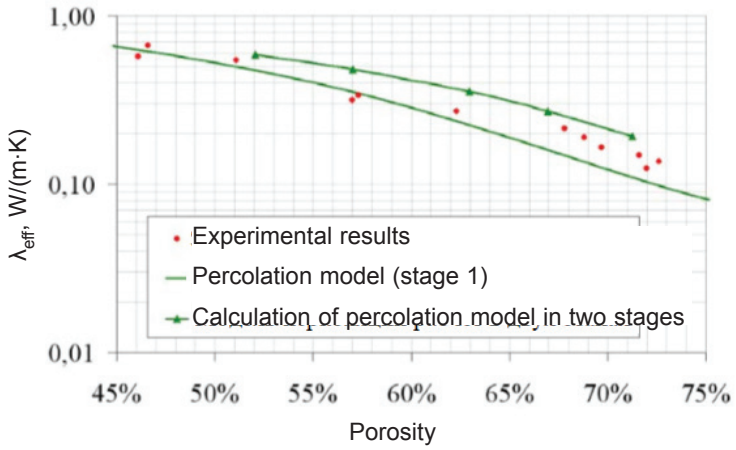

Fig. 4. Effective thermal conductivity depending on the porosity determined experimentally, analytical calculation and digital modeling.
Calculated data: λ_s = 1.9 W/(m·K), λ_s = 0.026 W/(m·K)

sufficient for their manipulation and research even at porosity over 70 %, due to the fact that we have not passed the percolation boundary for each of the groups of mesopores and macropores taken individually. The correctness of the choice of the analytical model is not questioned.

The results showed that the two-modal pore size distribution leads to an increase in thermal conductivity compared to the single-modal distribution. Fig. 4 compares the values of the effective thermal conductivity obtained experimentally, by analytical calculation and by digital modeling. Analytical calculations were made in two stages, so as to take into account two groups of pores (mesopores and macropores) and digital simulations are carried out on a model with a two-modal pore size distribution.

The results obtained by calculation and digital modeling are very close at porosity from 50 % to 65 %. Experimental results are lower than other results. With porosity greater than 65 %, the experimental values are close to the analytical calculation.

References

1. Raghavan, S. The effect of grain size, porosity and yttria content on the thermal conductivity of nanocrystalline zirconia / S. Raghavan, H. Wang, R.B. Dinwiddie, W.D. Porter // Scripta Materialia. – 1998. – Vol. 39. – P. 1119–1125.

2. ZHizhkin, A.M. Eksperimental'nye issledovaniya effektivnoy teploprovodnosti obraztsov iz materiala MR [Experimental studies of the effective thermal conductivity of samples of material MR] / A.M. ZHizhkin // Vestnik SGAU. Problemy i perspektivy razvitiya dvigatelestroeniya. – Samara : Samar. gos. aerokosm. un-t. – 2006. – № 2. – CH. 2. – S. 15–18.

3. Belov, S.V. Poristye pronitsaemye materialy : sprav. izd. [Porous permeable materials: right. ed.] / pod red. S.V. Belova. – M. : Metallurgiya, 1987. – 335 s.

4. ZHizhkin, A.M. Analiz fizicheskoy kartiny protsessa teploperedachi v materiale MR [Analysis of the physical picture of the heat transfer process in the material MR] / A.M. ZHizhkin, A.I. Belousov // Matematicheskoe modelirovanie informatsiionnykh protsessov i sistem v nauke,

tekhnike i obshchestve : Mezhvuz. sb. nauchn. trudov. – Samara, 2004. – S. 43–52.

5. Belousov, A.I. Konstruktsiya i proektirovanie uplotneniy vrashchayushchikhsya valov turbomashin dvigateley letatel'nykh apparatov : ucheb. posobie dlya vuzov [The design and design of the sealing of the rotating shafts of turbomachines of aircraft engines : a textbook for universities] / A.I. Belousov, V.A. Zrelov. – Kuybyshev, 1989. – 108 s.

Влияние структуры пористых материалов на теплопроводность

Ханфар Адам, Хуссейн Сафаа Мохаммед ридха Хуссейн, Наджари Хоссейн

ФГАОУ ВО «Самарский национальный исследовательский университет имени академика С.П. Королева», г. Самара (Россия)

Ключевые слова и фразы: герметизация; конструкция; тепловыделение; уплотнение; утечки.

Аннотация: В статье выявлена необходимость определения диапазона изменения параметров структуры пористого материала, обеспечивающих эффективную теплопроводность для его применения в качестве герметизирующего элемента. В результате исследования определена предельная эффективная теплопроводность образцов в зависимости от их пористости.

© Khanfar Adam, Hussain Safaa Mohammed Ridha Hussain, Nadjari Hossein, 2018

UDK 33

Volatility Modeling to Build a New Platform for Volatility Trading in Binary Options

Abdullah Al Nafis[1], L.A. Guzikova[2]

[1] *European University of Bangladesh, Dakka (Bangladesh);*
[2] *Peter the Great St. Petersburg Polytechnic University, St. Petersburg (Russia)*

Key words and phrases: binary options; volatility; volatility modelling; volatility trading; financial modelling and simulation.

Abstract: Binary options a unique platform to deal with volatility trading in either ways to capture the market moves and make profits according to systemic frame. In this platform technical analysis considers as the basic foundation to generate the information to understand the market mechanism and volatility moves. But at the time of continuous changing phenomenon makes the platform systematically obsolete to generate multiple value worthiness at a time to deal with volatility trading. To know at which extent opportunities are attainable and adopting a standard profit making system makes it necessary to think new dimension to deal in this platform. Volatility modeling consisting with technical analysis can create a sustainable system where profit making will be in a smarter way in comparison to existing one. To do so 3 factors are examined to build new system where volatility modeling can generate additional returns: 1) implementation of models to determine the attainable opportunities; 2) determination of market ranges to understand better moves; 3) combination of technical tools with financial modeling and more accuracy in Binary options.

1. Introduction

1.1. Background of research

In finance, a binary option is a type of option in which the payoff can take only two possible outcomes, either some fixed monetary amount (or a precise predefined quantity or units of some asset) or nothing at all (in contrast to ordinary financial options that typically have a continuous spectrum of payoff). The two main types of binary options are the cash-or-nothing binary option and the asset-or-nothing binary option [6]. The value of a digital option can be expressed in terms of the probability of exceeding a certain value, that is, the cumulative distribution function, which in the Black-Scholes equation is the Gaussian. Binary options are available to trade on

the following underlying instruments: Stock index futures, commodities futures, spot currency and economic data releases. Binary options are a relatively new and unique way to take part in the financial markets [6]. Over the past decade they have become popular instruments in Europe and Asia, and more recently, over the past few years, have not only gained acceptance, but have seen widespread growth in the United States, particularly within the retail trading community [4]. One of the main reasons trading binary option is risk control [3]. In any market profitability on any given trade is secondary, but risk management on every trade is mandatory and of the utmost concern. This is particularly true when participating in leveraged markets such as futures and currencies, where one mistake can not only result in large losses, but in some cases, losses that exceed the amount of capital in the trading account can create an ugly scenario like dreaded margin call [6]. Binary options appearing low barriers to entry offer several opportunities to participate in markets having limited capital with a relatively simple market mechanism [8]. Most importantly limited risk nature of these contracts makes it more acceptable.

1.2. Previous work and market mechanism

Binary options are considered binary because there are only two potential outcomes at expiration: 0 or 100. At expiration, the condition being speculating on can be simply either TRUE (100) or FALSE (0). When trading binary options, a strike price is simply a price condition speculating on. On a long trade, a binary option is considered in the money if the strike price is below the market price of the underlying [6]. On a long trade, a binary option is considered out of the money if the strike price is above the market price of the underlying. On a short trade, a binary option is considered in the money when the strike price is above the market price of the underlying. On a short trade, a binary option is considered out of the money when the strike price is below the market price of the underlying. On either a long or short trade, a binary option is considered at the money when the strike price and the market price of the underlying are the same [6]. Because a binary option can be settled at expiration only at $0 or $100, the price of the option will fluctuate between $0 and $100 up until expiration. As expiration approaches, if the underlying market price of the binary remains below the strike price, the contract value will continuously decrease to 0. If, however, the underlying market price remains above the strike price, the contract value will increase to 100. The higher the probability of a condition's occurring by expiration, the less payout odds (return on collateral) on trade. Binary options are fully collateralized [6]. The collateral on a long binary option contract is always the premium. The collateral on a short binary option contract is always $100 minus the premium. The profit on a successful short binary option trade is always the premium. The profit on a successful long binary option trade is always $100 minus the premium. Volatility trading simply directs speculating whether the underlying will stay in a certain range or come out of the range in either direction. Buying volatility directs speculation that the underlying asset will make a large move in one direction or another. Selling volatility directs speculation that the underlying asset will remain in a certain range by expiration [6]. As binary options approach expiration, premiums of options with strike prices around market price will have large deltas, as every dollar move can potentially make the difference between a $0 value at expiration and a $100 value at expiration. The wider a range that speculated an underlying asset will trade in, the lower payout odds on the trade. The tighter the range that speculated an underlying asset will stay in, the higher payout odds on the trade. The larger a move speculated an underlying asset will make, regardless of direction, the better payout odds are on the trade [6]. When going long volatility, the smaller a move speculated on using binary options, the lower payout odds will be on the trade.

Premium collection method bets on an underlying instrument staying within a certain range. This strategy is based on the idea of normal distribution, which suggests that an instrument is most likely to be at the same price at the beginning and end of a time interval. Binary options make this strategy more effective by limiting the potential losses [6]. The distance that strike prices should be from the market price is a function of many things, including cutoff parameters, market volatility, and option premiums. Premium collection strategies speculate on underlying instruments that have a tendency to hold toward a mean price rather than trend and using binary options with less duration in volatility short trading, as this minimizes exposure to extreme movements in the market [6].

1.3. Scope of research

The overall purpose of the research is to determine the volatility of the future markets and the role of binary options in this platform to make profit through volatility trading. Basic indicators and technical analysis provide general guidelines to survive in this market by making profits in several ways for traders [6]. Volatility trading in such a platform like Binary options is a very risk aversive way to make daily profit but not enough to determine the ceiling of the market. Further it provides easy ways to determine market moves but not giving multiple ways at a time to deal with volatility [8]. Volatility modeling will provide multiple ways to make safe entries to market knowing the facts that at which extent opportunities are attainable:

– implementation of models to determine the attainable opportunities;
– determination market ranges to understand better moves;
– combination of technical tools with financial modeling and more accuracy in Binary options.

1.4. Research methodology

Financial models are becoming increasingly common for traditional investment but also can have a great way to deal with Binary option as well [2]. The Generalized Autoregressive Conditional Heteroscedasticity (**GARCH**) & The exponential generalized autoregressive conditional heteroscedastic (**EGARCH**) volatility models determine multiple levels of market and several moves in each level to understand the attainable opportunities. Further **ARIMA** model (Autoregressive Integrated Moving Average) provides more accuracy about volatility directions [5].

The model is a generalized autoregressive conditional heteroscedasticity [1] model. Generally, when testing for heteroscedasticity in econometric models, the best test is the White test. However, when dealing with time series data, this means to test for ARCH and GARCH errors. Exponentially weighted moving average (**EWMA**) is an alternative model in a separate class of exponential smoothing models. It can be an alternative to GARCH modeling as it has some attractive properties such as a greater weight upon more recent observations, but also drawbacks such as an arbitrary decay factor that introduces subjectivity into the estimation

GARCH (Generalized Autoregressive Conditional Heteroscedasticity):

$$\sigma_t^2 = \omega + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \beta_i \sigma_{t-i}^2.$$

EGARCH (Exponential Generalized Autoregressive Conditional Heteroscedasticity).

The exponential generalized autoregressive conditional heteroscedastic model by [7] is another form of the GARCH model formally, known as an EGARCH:

$$\log \sigma_t^2 = \omega + \sum_{k=1}^{q} \beta_k g\left(z_{t-k}\right) + \sum_{k=1}^{p} \alpha_i \log \sigma_{t-k}^2 .$$

An autoregressive integrated moving average (**ARIMA**) model is a generalization of an autoregressive moving average (**ARMA**) model. These models are fitted to time series data either to better understand the data or to predict future points in the series (forecasting). They are applied in some cases where data show evidence of non-stationary, where an initial differencing step (corresponding to the "integrated" part of the model) can be applied to reduce the non-stationary.

ARIMA (Autoregressive Integrated Moving Average).

Non-stationary:

$$Y_t = \left(1 - L\right)^d X_t .$$

Wide-sense stationary:

$$\left(1 - \sum_{i=1}^{p} \varphi_i L^i\right) Y_t = \left(1 + \sum_{i=1}^{q} \theta_i L^i\right) \varepsilon_t .$$

Regression analysis.

Regression analysis will further provide the guidelines about to build a good equation which will explain further the goodness of fit of each model consisting with overall statistical analysis. Regression analysis will show the relationship and influence of trend future commodity markets upon the future indexes.

1.5. Proposed research

To predict market volatility in a realistic way and implement an effective model based on those observations it is more obvious to choose a platform where simulation will be result oriented according to previous trends. GARCH and ARIMA provide the chance to build such a model which observes previous trends based on **WMA** (Weighted Moving Average) and **EWMA** (Exponentially Weighted Moving Average) for EGARCH to produce more realistic and result oriented simulations for market moves. Regression analysis having a realistic as well result oriented outcomes indicating the goodness of models. The influence of the trend oriented commodity futures upon future indexes also provides opportunities to generate good equations which will bring equilibrium in the binary options portfolio management.

1.6. Potential problems and limitations

In this research project the potential problems mostly arise in collecting the sample data and the determination of data types. The one way fixed effects of volatility based on random selections from multiple observations make it complex to examine the data types. Mostly in this research data types are pooled cross sectional data.

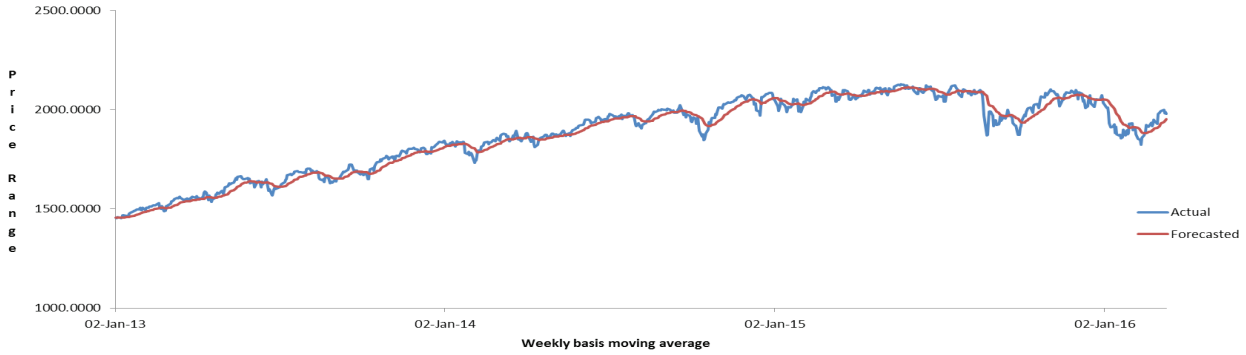

Fig. 1. S&P 500 Futures

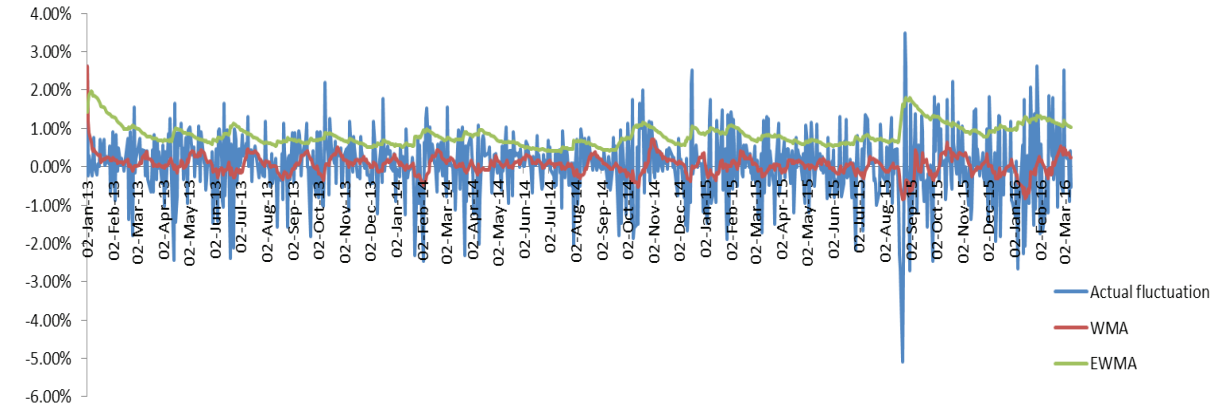

Fig. 2. Volatility analyzed by **ACF** (Autocorrelation Function) and **PACF** (Partial Autocorrelation Function)

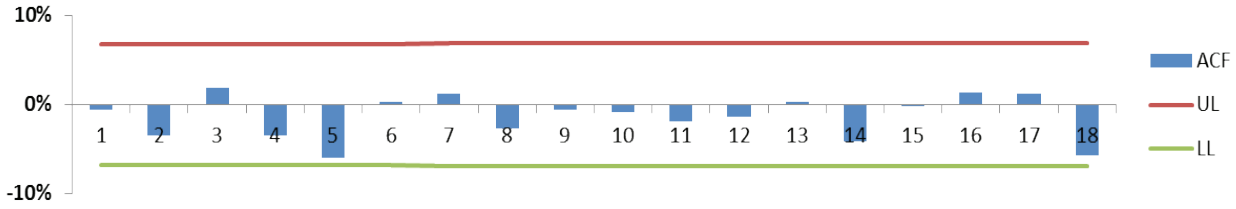

Fig. 3. Autocorrelation Function of S&P 500 Futures

2. Performing Financial Modeling and Simulation Dealing with Real Market Situation

NumXL software trial version 1.63.41825.1 was used to build primary model and simulation. Data on Future markets are available at: http://www.investing.com/indices.

Historical trend determine through **EWMA** (Exponentially Weighted Moving Average) considering Alpha = 0.1 (Fig. 1).

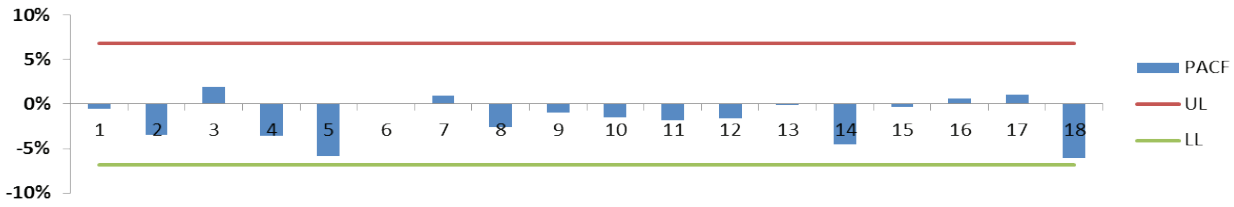

Fig. 4. Partial Autocorrelation Function of S&P 500 Futures

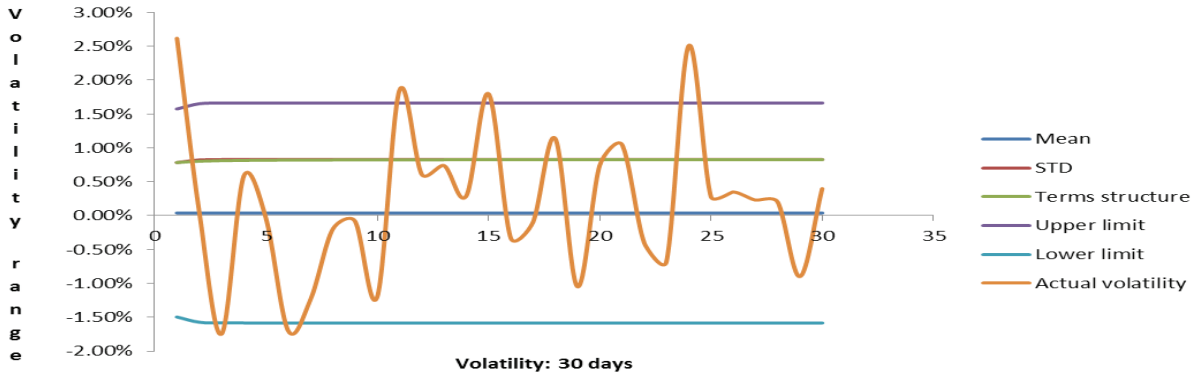

Fig. 5. GARCH Volatility modeling last 30 days

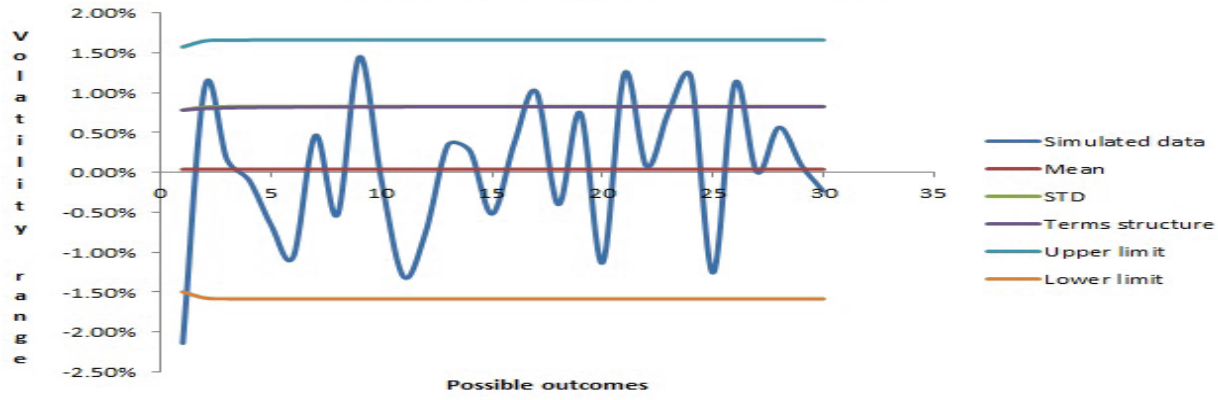

Fig. 6. Simulation for next month

GARCH volatility modeling is shown in figures 2–6.
ARIMA modeling is shown in figures 7–9.

3. Basic and Multiple Regression Analysis and Models Goodness of Fit

Regression analysis will further provide the guidelines about to build a good equation which will explain further the goodness of fit of each model consisting with overall statistical analysis.

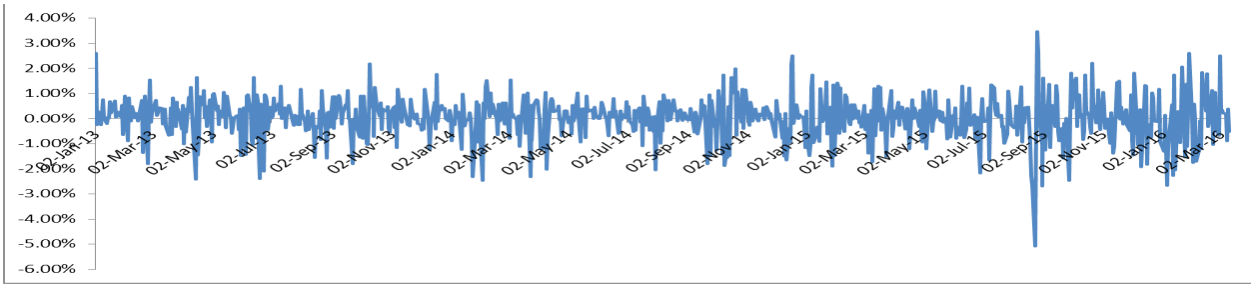

Fig. 7. Market fluctuation of real index

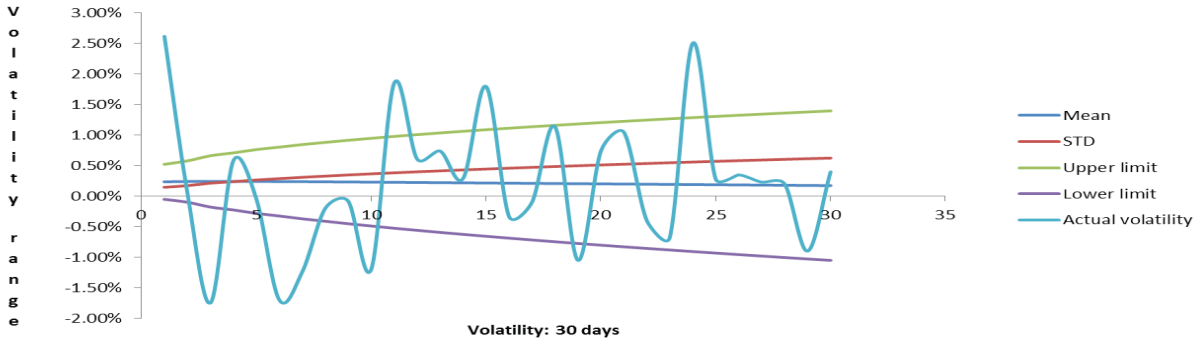

Fig. 8. ARIMA modeling of real index

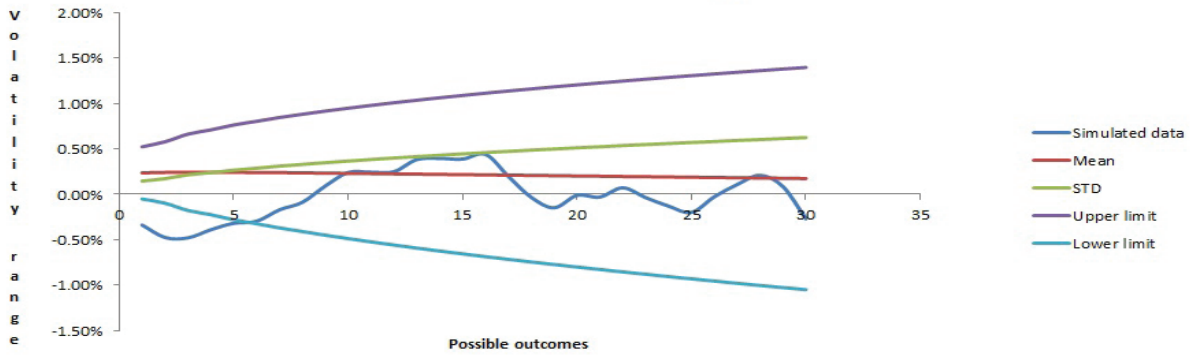

Fig. 9. Simulation for next month

To run regression analysis & generate models equation STATISTICA software version 7.0 was used. Regression analysis will show the relationship and influence of trend future commodity markets upon the future indexes. As mentioned earlier future indexes are more likely with a range oriented and due to that fact short volatility in future indexes are very effective to find edges. But building a bridge between the trend and range oriented markets its essential to find the commonness of these markets. Regression analysis will determine this commonness and also give the directions to make appropriate linkage of models builds in previous chapter by

N=780	Regression Summary for Dependent Variable: S&P 500 Futures R= .93356053 R²= .87153527 Adjusted R²= .87087222 F(4,775)=1314.4 p<0.0000 Std.Error of estimate: 68.724 Beta	Std.Err. of Beta	B	Std.Err. of B	t(775)	p-level
Intercept			-324.233	140.0994	-2.3143	0.020911
Gold	-0.176318	0.030921	-0.244	0.0428	-5.7022	0.000000
Silver	-0.548072	0.031963	-26.138	1.5243	-17.1472	0.000000
AUD/USD	0.706698	0.046120	1354.363	88.3868	15.3231	0.000000
USD/JPY	0.952081	0.037842	17.220	0.6844	25.1591	0.000000

Fig. 10. Regression summary of S&P 500 Futures

Statistic	Summary Value
Multiple R	0.934
Multiple R²	0.872
Adjusted R²	0.871
F(4,775)	1314.446
p	0.000
Std.Err. of Estimate	68.724

Fig. 11. The main indicators of the multiple regression models of S&P 500 Futures

Effect	Analysis of Variance; DV: S&P 500 Futures (F Sums of Squares	df	Mean Squares	F	p-level
Regress.	24832327	4	6208082	1314.446	0.00
Residual	3660297	775	4723		
Total	28492625				

Fig. 12. ANOVA multiple regression models of S&P 500 Futures

using GARCH and ARIMA modeling. Further based on these relationships appropriate equations will provide guidelines about to take necessary steps for making proactive system to generate stable profit.

The equation is as follows:

$$\overline{y} = -324.233 - 0.244x_1 - 26.138x_2 + 1354.363x_3 + 17.220x_4.$$

In other words with the changes of Gold 1 % there is a decrease in the fluctuation of S&P 500 Futures (–0.244). Also with a change in AUD/USD 1 % there is an increase in S&P 500 Futures (+1354.363). Similar can be said for the remaining indexes also.

Multiple correlation coefficient 0.934, and the coefficient of determination is equal to 0.872, that is, the proportion of explained variance, which reflects the influence of all signs of factors is 0.872. In other words, the variation of the values in S&P 500 Futures can be explained by the variation of signs only 87.20 %.

As for the individual features, it is clear that the parameters here necessarily significant.

Variable	Means and Standard Devia		
	Means	Std.Dev.	N
Gold	1277.052	138.1380	780
Silver	20.436	4.0102	780
AUD/USD	0.875	0.0998	780
USD/JPY	108.153	10.5739	780
S&P 500 Futures	1876.977	191.2483	780

Fig. 13. Means and standard deviations

As here value of every pair is above than standard t-statistics. The standard value of t-statistics about 2 and t-statistics indicate insignificance of these parameters.

Analysis of variance should pay special attention to assessing the F-test. The significance of the model is confirmed by the significance level test F, which reflects the number of times exceeds the residual dispersion factor - in this case, F-test is 1314.446. Compare this value with the table: 1314.446 > 2.53 and therefore we can conclude that the whole equation is statistically significant. If the equation is significant then the determination coefficient is significant.

The correlation matrix consists of a pair of correlation coefficients and the result of factors. It is necessary to justify the selection of the factors that will be included in the equation: the identification of the factors that significantly affect the result, as well as collinear factors. Note that the matrix is symmetric with respect to a unit diagonally symmetric as correlation coefficients are paired.

Checking for the presence of heteroscedasticity it can be carried out on the basis of Spearman rank correlation test. The test statistic is calculated using the formula, and if its value exceeds 1.96, at 5 % significance level, then it will disprove the null hypothesis of no heteroscedasticity. We carry out checks for the presence of the resulting model heteroscedasticity:

$$p*\sqrt{n-1} = 0.007369*\sqrt{780-1} = 0.007369*27.911 = 0.2057;$$

$$p*\sqrt{n-1} = 0.047780*\sqrt{780-1} = 0.047780*27.911 = 1.334;$$

$$p*\sqrt{n-1} = 0.061919*\sqrt{780-1} = 0.061919*27.911 = 1.728;$$

$$p*\sqrt{n-1} = 0.001757*\sqrt{780-1} = 0.001757*27.911 = 0.0490.$$

By comparing the calculated values with the set value (1.96) we can conclude that the calculated value not exceeds this value and therefore can be said about free from heteroscedasticity.

3.1. Forecasting of the Volatility

$$\Delta = tS = 2\sqrt{68.724} = 16.58;$$

$$\overline{y} = -324.233 - 0.244*1277.052 - 26.138*20.436 + 1354.363*0.875 + 17.220*108.153 = 1877.47.$$

The lower limit of the confidence interval:

$$(1877.47 - 16.58) = 1860.89.$$

The upper limit of the confidence interval:

$$(1877.47 + 16.58) = 1894.05;$$
$$1860.89 \le y \le 1894.05.$$

4. Conclusions

Binary options can be considered as a unique platform for traders having small capital want to invest their money in such a way where profitability can be achieved in every moves of the market by volatility trading. In binary options it's not necessary to predict where the market will go rather where it won't go it can only matter. This logic is quite easy to understand and provides limitations as well not permits to grab every moves of the volatility. To grab all the moves of volatility appropriate models can play a big role in managing effective binary options portfolio having stable profits. The authors tried to build effective models with practical simulated results in order to find the proper edge in every market associated with binary options. Regression analysis having a realistic as well result oriented outcomes indicating the goodness of models. The influence of the trend oriented commodity futures upon future indexes also provides opportunities to generate good equations which will bring equilibrium in the binary options portfolio management. Finally by the passage of time every system will lose its appeal but proactive improvements of system following the appropriate selection of models can extent and modify the existing system or can provide new dimensions to adopt the continuous changes.

References

1. Bollerslev, T. Generalized Autoregressive Conditional Heteroscedasticity / T. Bollerslev // Journal of Econometrics. – 1986. – No. 31(3). – P. 307–327.

2. Brooks, C. Introductory Econometrics for Finance : 3rd ed. / C. Brooks. – Cambridge : Cambridge University Press, 2014.

3. Cofnas, A. Trading Binary Options: Strategies and Tactics / A. Cofnas. – Wiley & Sons, 2016.

4. Coulling, A. Binary Options Unmasked / A. Coulling. – Create Space Independent Publishing Platform, 2015.

5. Hyndman, R.J. Forecasting: principles and practice / R.J. Hyndman, G. Athanasopoulos. – OTexts, 2013.

6. Nekritin, A. Binary options, strategies for directional and volatility trading / A. Nekritin. – Wiley & Sons, 2012.

7. Nelson, D.B. Conditional Heteroscedasticity in Asset Returns: A New Approach / D.B. Nelson // Econometrica. – 1991. – No. 59(2). – P. 347–370.

8. Obazee, P. Understanding the Building Blocks for OAS Models in Interest Rate, Term Structure, and Valuation Modeling / P. Obazee; Edited by F.J. Fabozzi. – Wiley & Sons, 2002.

Моделирование волатильности для создания новой платформы торговли волатильностью бинарных опционов

Абдулла аль-Нафис[1], Л.А. Гузикова[2]

[1] Европейский университет Бангладеш, г. Дакка (Бангладеш);
[2] ФГАОУ ВО «Санкт-Петербургский политехнический университет Петра Великого», г. Санкт-Петербург (Россия)

Ключевые слова и фразы: бинарные опционы; волатильность; моделирование волатильности; торговля волатильностью; финансовое моделирование.

Аннотация: Бинарные опционы – уникальная платформа для торговли волатильностью, позволяющая извлекать прибыль как из отдельных движений рынка, так и на основе его системной структуры. На этой платформе технический анализ рассматривается как главный источник информации для понимания рыночного механизма и колебаний. Но непрерывное изменение обусловливает столь же непрерывный процесс устаревания информации, что не позволяет длительное время использовать полученную информацию для торговли волатильностью. Чтобы оценить степень достижимости возможностей стандартной системы получения прибыли, необходимо задуматься о новом измерении для этой платформы. Моделирование волатильности, включающее в себя технический анализ, может создать устойчивую систему, в которой получение прибыли будет обеспечиваться более рациональным способом по сравнению с существующим. Для создания новой системы, в которой моделирование волатильности может генерировать дополнительную прибыль, рассматриваются 3 фактора: 1) реализация моделей для определения достижимых возможностей; 2) определение рыночных диапазонов для понимания лучших ходов; 3) сочетание инструментов технического анализа и финансового моделирования с большей точностью бинарных опционов.

© Abdullah Al Nafis, L.A. Guzikova, 2018

UDK 336.71

The Model to Assess the Relations of a Commercial Bank with Corporate Clients

G.N. Kovrova, A.I. Shmyreva

Novosibirsk State University of Economics and Management, Novosibirsk (Russia)

Key words and phrases: bank; banking strategy; corporate client; credit risk.

Abstract: The purpose of the research is to supplement the “risk-return” approach with an assessment of indicators characterizing the impact of the relations of a commercial bank with corporate clients on the bank’s capital. The study aims to determine the main assessment indicator of the relations of a commercial bank with corporate clients in terms of its impact on the bank’s capital, on a conditional example to conduct a quantitative and qualitative analysis of the client base to make managerial decisions on further cooperation. Research hypothesis is that risk weighted assets (**RWA**) and its regulatory ratio with the bank’s capital can be used to assess the bank’s relationship with the client. The author used such research methods as study and generalization, comparison, analysis and synthesis. The “risk-return” approach was supplemented by a quantitative and qualitative analysis of the risk weighted assets index.

Modern banking market has its own distinguishing features. On the one hand, it is a buyer’s market with a high level of competition, on the other hand, it is a market with ever-increasing prudential supervision by the Bank of Russia and other authorized supervisory bodies. The strengthening of regulatory measures is complemented by the introduction of additional Basel III standards (short-term liquidity indicator, capital conservation buffer, countercyclical buffer, etc.) and revocation of licenses from a number of credit institutions. According to the Bank of Russia, the number of operating credit institutions (credit institutions that have the right to conduct banking operations) decreased from 733 as of 01.01.2016 to 542 as of 01.04.2018 [8].

In such conditions, the commercial bank (**CB**) is forced to balance between the “client and capital”. However, possible consequences in the form of revocation of the license and termination of the activities of the bank make CBs seek a compromise from the position of regulatory measures and more carefully evaluate the credit risks and strive for a quality loan portfolio.

All of the above makes the issue of assessment the client base of CBs especially urgent and makes it necessary to look for methods for its implementation.

Table 1. The content of the "risk – return" approach
(Compiled by the author)

Step number	The content
1	Identifying a pool of customers using banking products with credit risk
2	Determination of the amount of gross income received by the CB from interaction with each client
3	Determination of the degree of risk for each client, as the equivalent of the client's credit rating, calculated by the CB methodology
4	Calculation of multidimensional average on the gross income from interaction with the client and credit rating of the client
5	Grouping of customers based on the received average value, using the Sturges formula: $n = 1 + 3{,}322 \lg N = \log_2 N + 1$ (N – number of units of population) and determining the value of the interval by the formula: $h = \frac{R}{n} = \frac{Xmax - Xmin}{n}$, if necessary, a secondary rearrangement is performed by enlarging the intervals
6	Formation of a group strategy for relationship of the bank with the clients: group "low income – high risk" (group A), group "low income – low risk" (group B), group "high income – high risk" (group C) and group "high income – low risk" (group D)

Table 2. The quantitative and qualitative analysis of the use of RWA in a commercial bank
(Compiled by the author)

Customer group	RWA	RWA share in its total value (%)
A "Low income – high risk"	RWA_a	$\frac{RWA_a}{\sum_d^a RWA} \times 100\,\%$
B "Low income – low risk"	RWA_b	$\frac{RWA_b}{\sum_d^a RWA} \times 100\,\%$
C "High income – high risk"	RWA_c	$\frac{RWA_c}{\sum_d^a RWA} \times 100\,\%$
D "High income – low risk"	RWA_d	$\frac{RWA_d}{\sum_d^a RWA} \times 100\,\%$
Total:	$\sum_d^a RWA = E \times 12.5,$ where E – aggregate bank capital	100

The authors previously proposed the "risk-return" approach based on the risk assessment and gross income of the CB customers. The content of the approach is given in Table 1.

The proposed approach allows solving the following problems:

1) to develop and apply a unified strategy within the whole commercial bank to a particular group of clients;

2) to control the movement of customers between groups with the identification of its causes (for example, changing the client's credit quality or declining gross income due to a more favorable offer from the competitor's bank) and timely adjusting the strategy for a particular customer;

3) to analyze the client base for the development and subsequent implementation of changes in credit policy, tariff policy and other internal regulatory documents CB for relationship between the bank and the client;

4) to identify potentially problematic clients and take the necessary measures to prevent the growth of work-out loans.

In the continuation of the study of the interaction between the CB and corporate clients, the authors complement the previously proposed methodological approach by assessing the use of bank's capital by analyzing the distribution of risk weighted assets by customer groups. Basel II provides that the ratio of aggregate capital (E) to risk weighted assets (**RWA**) should not exceed 8 %. Recall that the aggregate capital includes Tier I capital (stable capital elements, for example, stocks, retained earnings, etc.) and Tier II (less stable elements), and Tier II cannot amount to more than 50 % of Tier I. The calculation of risk weighted assets is carried out according to Basel II on the basis of the Standardized Approach or the Internal Ratings Based (**IRB**) Approach. The Standardized Approach is based on the use of external credit ratings of international rating agencies. The second approach involves the use of internal ratings calculated by the bank methodologies [5]. The capital conservation ratio N1, established by the Bank of Russia, has a similar minimum value of 8 %.

The maximum potential value of risk weighted assets can be defined as the product of the bank's aggregate capital (E) by 12.5, or RWA = E * 12.5. In view of the direct dependence of RWA on the bank's capital and the limitation of its maximum size, an important issue for the CB is the effective use of its RWA potential. The grouping of customers using the "risk-return" technique allows for a quantitative and qualitative analysis of the use of RWA and draw conclusions about the effectiveness of its use.

Otherwise, for each group of customers of the CB, the value of risk weighted assets is determined, or RWA_1, ... RWA_i, where i – is the number of formed groups, and also the share of the group RWA in the general RWA. An example of such an analysis is given in Table 2.

The CB should seek to increase the RWA share in group D. The high RWA share of this client group indicates the effective use of the available resources by the CB. Meanwhile, the high RWA share of group A suggests the opposite. Therefore, the CB is primarily interested in developing interaction with clients of group D and B, as potentially applying for a transition from group B to group D. Cooperation with group A and B clients should be aimed at reducing credit risk, both through additional measures in form of pledge, guarantees, sureties, and by reducing the interaction on banking products with credit risk.

Conclusion

The author's "risk – return" approach with its addition to the analysis of risk weighted assets in the context of client groups allows assessing the client base of the bank not only in terms

of return and risk, but also from the point of view of the effective use of the bank's capital. In addition, the information obtained helps to implement the optimal group strategy for relationship of the CB with the corporate clients.

References

1. Kovrova, G.N. Vzaimodejstvie kommercheskogo banka s korporativnymi klientami v usloviyakh nestabil'noj ekonomiki [Interaction of a commercial bank with corporate clients in an unstable economy] / G.N. Kovrova, A.I. SHmyreva // Ekonomika i predprinimatel'stvo. – 2017. – № 4. – CH. 2. – S. 677–679.

2. Leonova, N.G. Finansovye riski i novye informatsionnye tekhnologii [Finansovye riski i novye informatsionnye tekhnologii] / N.G. Leonova // Nauka i Biznes: Puti razvitiya. – M. : TMBprint. – 2018. – № 3(81). – S. 63–65.

3. O merakh po realizatsii Bazelya III i o regulirovanii deyatel'nosti sistemno znachimykh bankov [On measures to implement Basel III and on the regulation of the activities of systemically important banks] // Den'gi i kredit. – 2015. – № 8. – S. 77–78.

4. Pozdyshev, V.A. Bankovskoe regulirovanie v 2016–2017 godakh: osnovnye izmeneniya i perspektivy razvitiya [Banking regulation in 2016–2017: major changes and development prospects] / V.A. Pozdyshev // Den'gi i kredit. – 2017. – № 1. – S. 9–17.

5. Pomazanov, M.V. Adaptatsiya «prodvinutogo» podkhoda «Bazel' II» dlya upravleniya kreditnymi riskami v rossijskoj bankovskoj sisteme [Adaptation of the Basel II advanced approach for managing credit risks in the Russian banking system] / M.V. Pomazanov // Upravlenie finansovymi riskami. – 2009. – № 1. – S. 48–66.

6. Larionova, I.V. Risk-menedzhment v kommercheskom banke : monografiya [Risk management in a commercial bank : a monograph] / pod red. I.V. Larionovoj. – M. : Knorus, 2016. – 456 s.

7. Eliseeva, I.I. Statistika : uchebnik dlya bakalavrov; 3-e izd., pererab. i dop. [Statistics : a textbook for bachelors; 3rd ed., Revised and add.] / pod red. I.I. Eliseevoj. – M. : YUrajt, 2012. – 558 s.

8. Obzor bankovskogo sektora Rossijskoj Federatsii. Analiticheskie pokazateli [Overview of the banking sector of the Russian Federation. Analytical indicators] [Electronic resource]. – Access mode : http://www.cbr.ru/analytics/bnksyst.

Модель оценки взаимодействия коммерческого банка с корпоративными клиентами

Г.Н. Коврова, А.И. Шмырева

ФГБОУ ВО «Новосибирский государственный университет экономики и управления», г. Новосибирск (Россия)

Ключевые слова и фразы: банк; корпоративный клиент; кредитный риск; стратегия банка.

Аннотация: Цель исследования – дополнить методический подход «риск – доходность» оценкой показателей, характеризующих влияние взаимодействия коммерческого банка с корпоративным клиентом на капитал банка. Для достижения цели необходимо

решить следующие задачи: определить основной показатель для оценки взаимодействия коммерческого банка с корпоративными клиентами с точки зрения его влияния на капитал банка, на условном примере провести количественный и качественный анализ клиентской базы коммерческого банка для принятия управленческих решений по дальнейшему сотрудничеству. Гипотеза исследования: показатель величины активов, взвешенных с учетом риска, с учетом его нормативного соотношения с капиталом банка может быть использован для оценки взаимодействия банка с клиентом. Автором были применены такие методы исследования, как изучение и обобщение, сравнение, анализ и синтез. В ходе исследования методический подход «риск – доходность» был дополнен количественным и качественным анализом показателя активов, взвешенных с учетом риска.

© G.N. Kovrova, A.I. Shmyreva, 2018

UDK 330

Direction of Digital Economy in the Field of Public Administration of the Russian Federation

O.V. Voronkova

Peter the Great St. Petersburg Polytechnic University, St. Petersburg (Russia)

Key words and phrases: effective way of providing information; activity of public authorities; rendering public services to citizens and business; minimization of interaction between the state and the applicant.

Abstract: The article aims to study the features of the formation and development of E-government by methods of analysis of theoretical and practical data. The author analyzes the features of providing information about the activities of public authorities and public services to citizens, businesses, other branches of government and government officials, in which personal interaction between the government and the applicant is minimized. The study suggests the directions of development that will maximize the use of information technology, mobile technology and the Internet.

The development of digitalization of public administration is becoming especially urgent. Effective communication of citizens with the government and the government with businesses requires services of e-government. The e-government system enhances the feedback, speeds up interaction, and reduces the time for solving problems. The digital economy offers great opportunities for the development of e-government in Russia.

E-government is a technology and organizational measures, regulatory support for the organization of digital interaction between public authorities of different branches of government, citizens, organizations and other economic entities. An effective way of providing information about the activities of public authorities, the provision of public services to citizens, businesses, other branches of government and government officials, in which personal interaction between the state and the applicant is minimized, is envisaged. The opportunities provided by information technologies, mobile technologies and the Internet are used to the maximum.

Modern technologies make it possible to implement the idea of “the government as a platform|”, which will make it possible to completely minimize human error, get rid of corruption, will effectively assess the activities of civil servants, completely switch to electronic media and reduce the processing of a large number of documents. That will narrow the gap between major cities and regions and enhance the development and use of modern technology equally. This will also be important in light of the problem of Russia’s ageing population. This idea will help to improve the quality and reduce the time of management decision-making.

The example of one of the richest people in the world – Chinese entrepreneur Jack MA is

indicative. In his bank, he used the 310 principle, for the implementation of this principle the company worked for several years. 310 stands for the time required for processing of the bank enquiry, where 3 minutes is manual filling by the client of the request, 1 second is its processing, 0 is the time required for manual work at the execution stage, as everything is performed in the automatic mode.

E-government is becoming an open government. Research VTSIOM (all-Russian center for the study of public opinion) showed that 35 % of citizens believed that over the past 3 years, the work of the authorities became more open, 9 % had the opposite opinion, 39 % of the population did not notice the difference and 17 % found it difficult to answer. Of course, the openness of state bodies is associated with their effective work, the availability of information about this work and the provision of services in electronic form, as well as the establishment of trust between the state and citizens, through high-quality and fast work of civil servants.

The e-government carries a number of key risks that may arise in the implementation of the idea.

First of all, these are the following problems:

1) low level of infrastructure development for e-government, when in many regions the level of mass Internet access is low, so there is no possibility to use e-government;

2) slow adoption of necessary regulations, as well as resistance to existing governance structures;

3) lack of experience in the development and construction of such platforms for public administration, inertia and conservatism of society.

In order to implement and achieve all the goals, it is necessary to improve the regulatory framework that will meet the requirements of e-government, review the current legislation and transfer the main directions of norm-setting to the “digital basis”, adopt the necessary regulations. To establish a link between the information systems of the departments, by creating a digital ecosystem of the state, because in a turbulent environment, public authorities should use the most effective approach to decision-making, reduce the cost of the state apparatus, eliminating a huge amount of unnecessary documentation, functions and processes. It is necessary to use effective methods of evaluation of civil servants, minimizing poor quality and long work. It is also necessary to reduce the number of civil servants and reduce the cost of the wage Fund.

Currently, a significant part of public services is provided through multifunctional MFC centers. In fact, the MFC carries out the first and final stages of administrative procedures – advising the applicant, receiving and issuing documents. Thus, in St. Petersburg, with the help of the MFC, more than 350 public services are provided. According to the official data, the government institution “Multifunctional center for the provision of state and municipal services” (**MFC**) processed 3 million 800 thousand applications for the past year. It is obvious that with such a volume of document flow a significant human resource is spent. Promising is the assignment of some of the functions of MFC employees on robot androids. This will not only reduce the burden on professionals, but also helps to reduce the percentage of technical errors and the threat of corruption. Samples of Russian-made robots-androids are regularly presented at public events, in particular at the recently held in St. Petersburg XVII International forum “Ecology of the big city”. This is one of the leading directions of e-government development.

References

1. Vetrenko, P.P. Encouraging Employees to Increase the Labor Intellectualization Level as a Factor of Evolution of the Intellectual Capital at an Enterprise / P.P. Vetrenko, E.A. Chernysheva,

I.Yu. Levitina, O.V. Voronkova, D.G. Mikheeva // European Research Studies Journal. – 2017. – Vol. XX. – Issue 4B. – P. 637–646.

2. Voronkova, O.V. Nauka kak vazhnejshij sotsial'nyj institut [Science as the most important social institution] / O.V. Voronkova // Perspektivy nauki. – Tambov : TMBprint. – 2010. – № 12(14). – S. 5–7.

3. Voronkova, O.V. Voprosy razvitiya pensionnoj sistemy Rossii [Development issues of the Russian pension system] / O.V. Voronkova // Perspektivy nauki. – Tambov : TMBprint. – 2016. – № 5(80). – S. 29–34.

Направления развития цифровой экономики в сфере государственного управления РФ

О.В. Воронкова

ФГАОУ ВО «Санкт-Петербургский политехнический университет Петра Великого», г. Санкт-Петербург (Россия)

Ключевые слова и фразы: деятельность органов государственной власти; минимизация взаимодействия между государством и заявителем; оказание государственных услуг гражданам и бизнесу; эффективный способ предоставления информации.

Аннотация: С целью изучения особенностей формирования и развития системы Электронного правительства методами анализа теоретических и практических данных анализируются особенности предоставления информации о деятельности органов государственной власти, оказание государственных услуг гражданам, бизнесу, другим ветвям государственной власти и государственным чиновникам, при котором личное взаимодействие между государством и заявителем минимизировано. В результате исследования предложены направления развития, которые позволяют максимально использовать возможности, предоставляемые информационными технологиями, мобильными технологиями и сетью Интернет.

© O.V. Voronkova, 2018

UDK 373

Theoretical Grounds of Teaching in Adolescence

K.R. Khachaturova

School No. 129, Saint-Petersburg (Russia)

Key words and phrases: adolescent; personality development; social maturity.

Abstract: The purpose of this article is the analysis, theoretical justification, development and testing of the learning and teaching process in adolescence. The objective is to identify the structural components of adolescence and give a new definition of a teenager. The hypothesis is that the process of education of adolescents during schooling can be qualitatively transformed, taking into account the main stages of adolescence and indicators of levels. To solve the problems and test the hypothesis a set of research methods, such as general scientific, experimental and psychodiagnostic methods were used.

Adolescence is one of the critical periods of ontogenesis associated with fundamental changes in the sphere of consciousness, activity and system of individual relationships. This stage is characterized by rapid human growth, the formation of the body during puberty, which has a noticeable effect on the psycho-physiological characteristics of the teenager. The basis of the formation of new psychological and personal qualities of adolescents is communication in the process of various activities carried out by them (educational, industrial activities, various kinds of creativity, sports, etc.). In the common terminology of the United Nations population Fund, adolescents are defined as persons between the ages of 10 and 19 years (according to this terminology, early adolescence is from 10 to 14 years; late adolescence lasts from 15 to 19 years). In determining the time frame and the main stages of adolescence, there is no complete consistency in the different views that occur in connection with the differentiation of adolescence by geographical, cultural and other characteristics. Based on the UN data, in 2017, there were more than one billion teenagers in the world. In a sense, adolescence is unique because many components of the adolescent psyche are at the stage of active formation [2].

In the developmental process there is a development of both visual-figurative and theoretical thinking [6]. Adolescence is complicated by the fact that each individual already has his or her own opinion and idea about a particular aspect, but does not yet have the ability to assess the situation and analyze their own mistakes/

In addition, adolescence is one of the most important periods for the formation of human personality and the study of this period is important and necessary for the further development of pedagogy and psychology. A person receiving knowledge in any educational system is a student. This concept emphasizes that it is an active, purposeful and internally motivated subject of the educational process. Each student has individual personal and activity characteristics,

i.e. features of inclinations, abilities, intellectual activity, cognitive style, level of claims, self-assessment, working capacity, features of performance of activity. At the same time, all students at a certain stage of the educational system are characterized by the initial General and typical features. Each age period in a person's life is determined by a set of many factors that act as its indicators.

The first researcher of adolescence was John Amos Comenius (1592–1670), a Czech public figure who laid the foundations of modern scientific pedagogy. Comenius divided life into four periods, each of six years, and included the period of adolescence in a person's life and mentioned such age-related features of adolescence as the development of memory and imagination. We are not talking about a serious study of adolescence, but John Amos Comenius first identified adolescence as a special period. In the process of teaching teenage children there is assimilation of thinking in concepts, without which "there is no understanding of the relations behind the phenomena". As a subject of educational activity, a teenager is characterized by a tendency to assert his position of subjective exclusiveness, "individuality", the desire to stand out. This can enhance cognitive motivation, if correlated with the content of educational activities – its subject, means, ways of solving educational problems, develops potential in creative activity. The analysis of approaches to the study of creativity and the creative potential in the foreign and domestic psychology shows that the majority of them understand human creativity as ability to exercise its individual characteristics. The creativity is characterized by universality and accessibility for everyone; creativity is not only a means of human adaptation to the external conditions of reality, but also a tool for qualitative changes [4]. In the development of the creative potential of the teenager is formed the nature of cognitive interests of adolescents – there is an interest in relation to a particular academic subject, a specific interest in its content. The learning process is a complex unity of teacher and students' work directed towards a common goal – acquisition of knowledge, development of skills and abilities [5]. A favorable source of the fullness of the spiritual life of a teenager is creative work, the fusion of creativity and reason and the prevention of "emptiness of the soul of a teenager" as a major disaster.

Adolescence is an important point of modern education and requires special attention in the formation of the personality of a teenager, his socialization in educational and training activities. All actions of the teenager correlate with the search for individuality in the unknown [2]. The teenager is different from a child of the 1990s: children are no worse or no better than their peers two decades ago, they are different [1, p. 49].

The basis of successful learning activities of any student is a high level of motivation for this type of activity. In order for teenagers to realize their potential in educational activities, it is necessary to study in advance the motivation of students, to assess the likely problems in the motivational sphere and contribute to its formation.

References

1. Feldstein, D.I. Modern childhood as a socio-cultural and psychological phenomenon / D.I. Feldstein // Universum: Herzen University Bulletin. – 2012. – No. 1. – P. 20–29.

2. Khachaturova, K.R. Development of creative potential of senior teenagers by means of subjects of natural science cycle : dis. … kand. PED. Sciences / K.R. Khachaturova. – Veliky Novgorod, 2017. – 253 p.

3. Khachaturova, K.R. The Role of natural science subjects for the development of creative potential of primary school students / K.R. Khachaturova, G.N. Stepanova // Prospects of science. – Tambov : TMBprint. – 2015. – No. 8(71). – P. 42–46.

4. Khachaturova, K.R. Development of creative potential of secondary school pupils in natural-science subjects / K.R. Khachaturova // Reports Scientific Society. – 2016. – No. 1(12). – P. 9–14.

5. Khachaturova, K.R. The model of the educational process to develop the capacity for creativity in schoolchildren / K.R. Khachaturova // Components of Scientific and Technological Progress. – 2016. – No. 3(29). – P. 30–34.

6. Sheraizina, R.M. Age peculiarities of development of creative potential of older adolescents in educational work / R.M. Sheraizina, K.R. Khachaturov, I.A. Donina // Psychological culture of personality : monograph. – Ulyanovsk, 2017. – P. 106–118.

Теоретические особенности обучения в подростковом возрасте

К.Р. Хачатурова

ГБОУ Школа № 129, г. Санкт-Петербург (Россия)

Ключевые слова и фразы: подросток; подростковый возраст; развитие личности; социальная зрелость.

Аннотация: Целью данной статьи является анализ, теоретическое обоснование, разработка и апробация процесса обучения в подростковом возрасте. В качестве задачи выступает выявление структурных компонентов подросткового возраста и авторское определение понятия «подросток». Гипотеза заключается в предположении о том, что процесс образования детей подросткового возраста во время обучения в школе может быть качественно преобразован, если учитывать основные этапы подросткового возраста и показатели уровней. Для решения поставленных задач и проверки гипотезы использован комплекс методов исследования: общенаучные, экспериментальные и психодиагностические.

© K.R. Khachaturova, 2018

UDK 80

Using Android Applications in Learning the Russian Language in Google Play

M. Moghaddam Khademi

Tarbiat Modares University, Tehran (Iran)

Key words and phrases: app; Android; Russian language; Google Play.

Abstract: Over the past seven years, the use of applications for smartphones has increased rapidly and become a widely discussed problem in the field of education and development of students. The increasing popularity of mobile applications does not improve their quality. The article gives a classification and a brief overview of some educational applications that exist in Google Play.

In today's world, most students regardless of their ethnic or socio-economic background have access to a smartphone. Compared to other digital devices (e.g. laptops, mobile phones and personal computers), mobile devices with touch screens are by far the most popular among the younger generation, and this trend is growing rapidly. An increasing number of educational apps are available for free or for a fee of two popular online stores (Google Play and App Store).

Educational applications used in the study of the Russian language, existing in Google Play, can be divided into 5 groups:

1) applications for the visual study of the Russian language;
2) the application grammar of the Russian language;
3) applications for translation (dictionaries);
4) applications for Russian literature;
5) applications-books to read.

1. Applications for the visual study of the Russian language

Among the applications for the visual study of the Russian language can be identified:

1.1. Busuu – Language Learning Easy

As a member of the busuu community, students can do both spoken and written exercises corrected by native speakers. They can also help others in their own language. Using this app, students can transform their travel experiences, improve your memory skills, practice with real native speakers, to study or live abroad and, even better, to meet new people and develop friendships throughout life.

1.2. Russian in a Month

Students relate what they hear to what they see and learn the meaning of each word or phrase by comparing the differences between actions or things.

1.3. Language Center

Using this application, the student can learn 57 languages, including English, French,

German, Spanish, Italian, Arabic, Turkish, Russian and dozens of other languages. That is, what distinguishes it from other applications created in Iran.

2. The grammar application of the Russian language

2.1. Russian

The application is a game in the form of questions and answers on different sections of the Russian language. In the interactive mode, answering questions, the student can test their literacy. After passing the test, he will receive an assessment of their knowledge in the range from 1 to 5+. After passing all the tests, the student will know your score on each topic and in General in the Russian language. Grammar: Russian language Course.

This quiz game will help students to write words correctly, and adults will be able to remember the school course of the Russian language and test their knowledge of spelling. The game has more than 600 vocabulary words ranging from the simplest to the most complex. All words are divided into four levels of difficulty, and the spelling of any word can be checked in the dictionary. Take tests, share with friends, check your spelling, create your own dictionaries and download new ones – these are the features of this application.

2.2. Russian verbs pro

The features of this application include more than 1000 conjugated Russian verbs (30% in the demo); search in Russian, English, French and Spanish; built-in Russian keyboard with Cyrillic.

3. Applications for translation (dictionaries)

3.1. GoldenDict

This is the fastest and most multi-format dictionary app on Google Play. Fully supports dictionaries formats Lingvo, Babylon, StarDict, Lingoes and:. The search is almost instantaneous.

4. Applications for Russian literature

4.1. A.S. Pushkin. All poems

This collection contains more than 120 poems: the Application consists of two parts: poems and favorites. The favorites sector allows you to add, quickly find poems in the General list. Simple and nice interface will allow the student to enjoy the work of the great Russian poet.

4.2. L.N. Tolstoy “Anna Karenina”

The application uses materials that are in the public domain. This novel is the best work of world literature.

5. Applications-books for reading

5.1. Russian Name and Meanings – Definition of Name

This app works as a name generator and can give students some information about names. You can find the meaning of the name, origin, etc.

5.2. The Constitution of the Russian Federation for free

The advantages of this application is as follows: easy navigation through the articles; article pages scroll up and down; flipping articles left and right; detailed content with the ability to instantly navigate to the selected article; search function in the text of the document; the ability

to set bookmarks; font size settings; does not require an Internet connection; it is possible to install on an SD card.

5.3. Wise words

More than 5500 of the best statements of philosophers, thinkers, poets and various figures can enjoy reading in the subway, at home or on a business trip. The advantages of this application include a wide variety of quotes; search for quotes, authors and tags; the ability to display quotes by tags, authors or by accident; the presence of favorite quotes; the ability to share a quote with friends by E-mail, SMS, Facebook,Twitter or other social networks.

Consideration of the above Android applications shows that most of these applications are free of charge, but some of them limit the application, i.e., the student can use free only part of the features, and for full use must pay any amount.

References

1. Bentrop, S.M. Creating an educational app rubric for teachers of students who are deaf and hard of hearing / S.M. Bentrop // Independent Studies and Capstones. Paper 680. Program in Audiology and Communication Sciences. – Washington University School of Medicine, 2014 [Electronic resource]. – Access mode : http://digitalcommons.wustl.edu/pacs_capstones/680.
2. Brown, Q. Clear panels: A technique to design mobile application interactivity / Q. Brown, E. Bonsignore, L. Hatley, A. Druin, G. Walsh, E. Foss, R. Brewer, J. Hammer, E. Golub // In Proceedings of the 8th ACM Conference on Designing Interactive Systems. – ACM, New York, NY, USA, 2010. – P. 360–363.
3. Papadakis, S. Educational apps from the Android Google Play for Greek preschoolers: A systematic review / S. Papadakis, M. Kalogiannakis, N. Zaranis // Computers & Education, 2017.
4. [Electronic resource]. – Access mode : https://play.google.com/store?hl=en&tab=w8.

Использование андроид-приложений для изучения русского языка в Google Play

Хадеми Могаддам Мохсен Али

Университет Тарбиат Модарес, г. Тегеран (Иран)

Ключевые слова и фразы: андроид; приложение; русский язык; Google Play.

Аннотация: За семь прошедших лет использование приложений для смартфонов быстро возросло и стало горячо обсуждаемой проблемой в области образования и развития учащихся. Увеличение популярности мобильных приложений не приводит к повышению их качества. В статье дана классификация и краткий обзор некоторых образовательных приложений, существующих в Google Play.

© M. Moghaddam Khademi, 2018

List of Authors

Khanfar Adam – Graduate Student, Samara National Research University named after Academician S.P. Korolev, Samara (Russia, Iraq), e-mail: khanfar.adam@gmail.com

Ханфар Адам – аспирант Самарского национального исследовательского университета имени академика С.П. Королева, г. Самара (Россия, Ирак), e-mail: khanfar.adam@gmail.com

Hussain Safaa Mohammed Ridha Hussain – Graduate Student, Samara National Research University named after Academician S.P. Korolev, Samara (Russia); Karbala State University Karbala (Iraq), e-mail: safaa_m333@yahoo.com

Хуссейн Сафаа Мохаммед ридха Хуссейн – аспирант Самарского национального исследовательского университета имени академика С.П. Королева, г. Самара (Россия); Кербела Государственный Университет, г. Кербела (Ирак), e-mail: safaa_m333@yahoo.com

Nadjari Hossein – Graduate Student, Samara National Research University named after Academician S.P. Korolev, Samara (Russia, Iraq), e-mail: hosseinnadjari@gmali.com

Наджари Хоссейн – аспирант Самарского национального исследовательского университета имени академика С.П. Королева, г. Самара (Россия, Ирак), e-mail: hosseinnadjari@gmali.com

Abdullah Al Nafis – Lecturer (Accounting & Finance), European University of Bangladesh, Dhaka (Bangladesh), email: nauka-business@mail.ru

Абдулла аль-Нафис – преподаватель (бухгалтерский учет и финансы) Европейского университета Бангладеш, г. Дакка (Бангладеш), e-mail: nauka-bisnes@mail.ru

L.A. Guzikova – Doctor of Economics Science, Professor, Higher School of Engineering and Economics, Peter the Great St. Petersburg Polytechnic University, St. Petersburg (Russia), e-mail: nauka-bisnes@mail.ru

Л.А. Гузикова – доктор экономических наук, профессор Высшей инженерно-экономической школы Санкт-Петербургского политехнического университета Петра Великого, г. Санкт-Петербург (Россия), e-mail: nauka-bisnes@mail.ru

G.N. Kovrova – Postgraduate Student, Novosibirsk State University of Economics and Management, Novosibirsk (Russia), e-mail: gkovrova@mail.ru

Г.Н. Коврова – аспирант Новосибирского государственного университета экономики и управления, г. Новосибирск (Россия), e-mail: gkovrova@mail.ru

A.I. Shmyreva – Doctor of Economics, Professor, Department of Financial Market and Financial Institutions, Novosibirsk State University of Economics and Management, Novosibirsk (Russia), e-mail: a.i.shmyreva@edu.nsuem.ru

А.И. Шмырева – доктор экономических наук, профессор кафедры финансового рынка и финансовых институтов Новосибирского государственного университета экономики и управления, г. Новосибирск (Россия), e-mail: a.i.shmyreva@edu.nsuem.ru

O.V. Voronkova – Doctor of Economic Sciences, Professor, Peter the Great St. Petersburg Polytechnic University, St. Petersburg (Russia), e-mail: nauka-bisnes@mail.ru

О.В. Воронкова – доктор экономических наук, профессор Санкт-Петербургского политехнического университета Петра Великого, г. Санкт-Петербург (Россия), e-mail: nauka-bisnes@mail.ru

K.R. Khachaturova – Candidate of Pedagogical Sciences, Teacher, School No. 129, St. Petersburg (Russia), e-mail: karinah@inbox.ru

К.Р. Хачатурова – кандидат педагогических наук, учитель физики ГБОУ Школа № 129, г. Санкт-Петербург (Россия), e-mail: karinah@inbox.ru

M. Moghaddam Khademi – Candidate of Philological Sciences, Graduate of Tarbiat Modares University, Tehran (Iran), e-mail: Mohsenkhademi.63@gmail.com

Хадеми Могаддам Мохсен Али – кандидат филологических наук, выпускник аспирантуры университета Тарбиат Модарес, г. Тегеран (Иран), e-mail: Mohsenkhademi.63@gmail.com

For notes

COMPONENTS OF SCIENTIFIC AND TECHNOLOGICAL PROGRESS
№ 2(36) 2018
SCIENTIFIC AND PRACTICAL JOURNAL

Manuscript approved for print 19.06.18
Format 60.84/8
Conventional printed sheets 4.42
Published pages 3.89
200 printed copies

Printed by Zonari Leisure LTD. Paphos