IRSTI 72.15.33

U. Sabyr[1]
[1]Suleyman Demirel University
Almaty, Kazakhstan

ANALYSIS OF THE DEVELOPMENT OF EXPORT TRADE IN THE REPUBLIC OF KAZAKHSTAN

Abstract. Kazakhstan has embarked on an ambitious diversification program, aimed at developing targeted sectors like transport, pharmaceuticals, telecommunications, petrochemicals and food processing. In 2010 Kazakhstan joined the Belarus-Kazakhstan-Russia Customs Union in an effort to boost foreign investment and improve trade relationships. The Customs Union evolved into the Eurasian Economic Union in January 2015. During 2014, Kazakhstan's economy was hampered by Russia's slowing economy, the weakening ruble, falling oil prices, and problems at its Kashagan oil field. Kazakhstan devalued its currency, the tenge, by 19 percent in February and in November the government announced a stimulus package to cope with the economic challenges.

This article describes the general position of Kazakhstan in export trade. For this, a descriptive analysis of the data is used based on the areas of economic development of Kazakhstan already studied. The common goal is to identify the reasons and solutions to the problems at this stage of the economy development, as well as the forecast for the next five years.

Key words: Every eport, export policy, trade policy management, GDP, industries, economic growth, import trade, model, prophet model, prediction.

***

Аңдатпа. Қазақстан көлік, фармацевтика, телекоммуникация, мұнай-химия және азық-түлік өнімдерін өңдеу сияқты мақсатты секторларды дамытуға бағытталған ауқымды әртараптандыру бағдарламасын іске асыруға кірісті. 2010 жылы Қазақстан Беларусь - Қазақстан-Ресей кедендік одағына қосылып, шетелдік инвестицияларды ұлғайтуға және сауда қатынастарын жақсартуға бағытталған. Кедендік одақ 2015 жылдың қаңтарында Еуразиялық экономикалық одаққа айналды. 2014 жылы Қазақстан экономикасы Ресейдің бәсеңдемейтін экономикасы, рубльдің әлсіреуі, мұнай бағасының құлдырауы және Қашаған кен орнындағы проблемалар болды. Ақпан айында және қарашада Қазақстан валютаның теңгеге девальвациясын 19 пайызға төмендетіп, экономикалық қиындықтармен күресу үшін ынталандыру пакетін жариялады.

Бұл мақалада Қазақстанның экспорттық саудадағы жалпы позициясы сипатталған. Бұл үшін деректердің сипаттамалы талдауы

қазіргі уақытта зерттелген Қазақстан экономикасының даму бағыттары негізінде қолданылады. Жалпы мақсаты - экономиканы дамытудың осы кезеңіндегі проблемалардың себептерін және шешімдерін анықтау, сондай-ақ алдағы бес жылдағы болжам.

***

Аннотация. Казахстан приступил к осуществлению амбициозной программы диверсификации, направленной на развитие таких целевых секторов, как транспорт, фармацевтика, телекоммуникации, нефтехимия и пищевая промышленность. В 2010 году Казахстан присоединился к Таможенному союзу «Беларусь-Казахстан-Россия» в целях стимулирования иностранных инвестиций и улучшения торговых отношений. Таможенный союз превратился в Евразийский экономический союз в январе 2015 года. В течение 2014 года экономике Казахстана мешала замедляющаяся экономика России, ослабление рубля, падение цен на нефть и проблемы на ее месторождении Кашаган. Казахстан девальвировал свою валюту, тенге, на 19 процентов в феврале, а в ноябре правительство объявило пакет стимулов для решения экономических проблем.

В данной статье описано общее положение Казахстана в экспортной торговли. Для этого используется описательный анализ данных на основе уже изученных областях развития экономики Казахстана. Общей целью является выявление причин и выходов к решению проблем на данный этап развития экономики, а также прогноза на ближайшие пять лет.

Introduction

GDP (official exchange rate): 225.6$ billion (2014 est.).

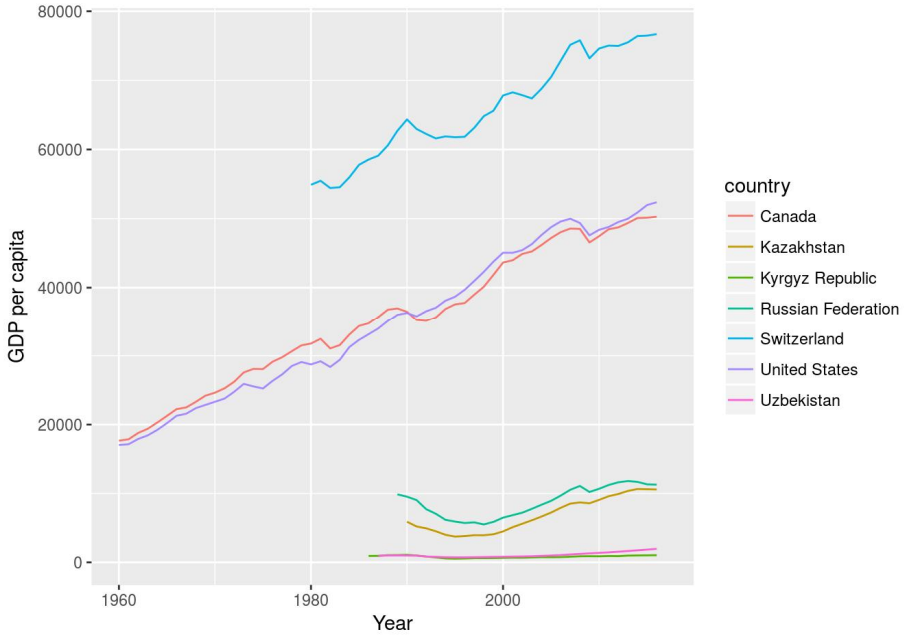
GDP (purchasing power parity): 420.6$ billion (2014 est.), 402.1$ billion (2013 est.), 379.3$ billion (2012 est.), country comparison to the world: 43. Kazakhstan’s GDP has increased every year since 2000. In 2004 the estimated GDP was US 39.8$ billion, an increase of 9.3% over 2003. The 2005 figure was US 47.4$ billion. Gross National Product (GNP) was estimated in 1993 at US 26.5$ billion [1].

Growth: GDP - real growth rate: 4.6% (2014 est.), 6% (2013 est.). 5% (2012 est.), country comparison to the world: 58. Growth was over 10% in 2000, 2001 and 2002, and 9.3 in 2003, 9.4% in 2004 and over 9 % in 2005, 2006 and 2007. Oil expansion accounted for most of the growth. Average growth between 1990 and 1998 was 1.9% . In 1994 the estimated growth rate - 25.4% . In the early 1990s, growth was hindered by Soviet-era specialization and centralization, and slow privatization.

GDP: per capital (PPP): 24,100$ (2014 est.) 23,400$ (2013 est.), 22,400$ (2012 est.), country comparison to the world: 74. In 2005 per capital

GDP was US 3,118$. Average annual income in 2003: 11,190$. Gross National Product (GNP) was estimated in 1993 at US 1,530$ per capital.

GDP - composition, by sector of origin: agriculture: 4.9%; industry: 29.5% ; services: 65.6% (2014 est.). GDP - composition, by end use: household consumption: 47.7% ; government consumption: 10.5% ; investment in fixed capital: 24.3% ; investment in inventories: 3.7%; exports of goods and services: 40.8% ; imports of goods and services: -27% (2014 est.). Services contributed 54.7% , industry 38.6% , and agriculture 6.7% of the 2005 GDP.



Pic 1. GDP of all countries

Inflation rate (consumer prices): 6.7 %(2014 est.); 5.8% (2013 est.). Inflation slowed from 17.8% in 1999 to 9.8% in 2000 to 6.9% in 2001. In 1999 devaluation of the national currency caused inflation to rise dramatically, but the rate for 2000 was only 9.8% , and it has remained below that level in subsequent years. In 2004 Kazakhstan's inflation rate was 6.9% , and in 2005 it rose slightly to 7.6% . The official target for 2006 and 2007 was in the range of 5.7 to 7.3% .

Kazakhstan experienced hyperinflation after independence in the early 1990s. In 1993 and 1994 the inflation rate was 1,880% . After that inflation was brought under better control with tightened loan policy. In 1995 inflation was estimated to be around 190%.

Unemployment rate: 5.1% (2014 est.); 5.2% (2013 est.). In the early 2000s, unemployment was estimated to be around 14% , as high as 50% in cities away from the oil fields.

Gross national saving: 28.6% of GDP (2014 est.), 27% of GDP (2013 est.) 26.1% of GDP (2012 est.), country comparison to the world: 35.

Sectors of the Kazakhstan Economy

Agriculture: Large-scale misallocation of land in Soviet Virgin Lands program, emphasizing cultivation over livestock, continues to distort land use. Main crops wheat, cotton, and rice; main livestock products meat and milk. State farms continue to dominate, 1996; land privatization minimal [2].

Industry and Mining: Outmoded heavy industry infrastructure inherited from Soviet era, specializing in chemicals, machinery, oil refining, and metallurgy; coal, iron ore, manganese, phosphates, and various other minerals mined. Some light industry. Industrial productivity hampered by lost markets and enterprise debt.

Energy: Plentiful reserves of oil, coal, and natural gas make energy production dominant industrial sector. Offshore Caspian Sea fields, still in early production stages, have huge capacity; extraction expanding with Western investment and new pipeline project. Natural gas fields, notably Karachaganak, expand output in the 1990s. Thermoelectric power plants, main source of power, fueled by lignite mines. Kazakhstan remains a net importer of energy and fuel [3].

Fiscal Policy: Centralized system; fundamental streamlining of tax code, emphasizing taxation of individuals over taxation of enterprises. Exports: Mainly raw materials: metals, oil and petroleum products, natural gas, chemicals. Imports: mainly energy products, machinery, vehicles, chemicals, and food.

Main model of analysis

Today Facebook is open sourcing Prophet, a forecasting tool available in Python and R. Forecasting is a data science task that is central to many activities within an organization. For instance, large organizations like Facebook must engage in capacity planning to efficiently allocate scarce resources and goal setting in order to measure performance relative to a baseline. Producing high quality forecasts is not an easy problem for either machines or for most analysts. They have observed two main themes in the practice of creating a variety of business forecasts:

- Completely automatic forecasting techniques can be brittle and they are often too inflexible to incorporate useful assumptions or heuristics.
- Analysts who can produce high quality forecasts are quite rare because forecasting is a specialized data science skill requiring substantial experience.

The result of these themes is that the demand for high quality forecasts often far outstrips the pace at which analysts can produce them. This observation is the motivation for our work building Prophet: they want to make it easier for experts and non-experts to make high quality forecasts that keep up with demand.

The typical considerations that "scale" implies, computation and storage, aren't as much of a concern for forecasting. They have found the computational and infrastructure problems of forecasting a large number of time series to be relatively straightforward — typically these fitting procedures parallelize quite easily and forecasts are not difficult to store in relational databases such as MySQL or data warehouses such as Hive.

The problems of scale they have observed in practice involve the complexity introduced by the variety of forecasting problems and building trust in a large number of forecasts once they have been produced. Prophet has been a key piece to improving Facebook's ability to create a large number of trustworthy forecasts used for decision-making and even in product features.

Where Prophet shines

Not all forecasting problems can be solved by the same procedure. Prophet is optimized for the business forecast tasks they have encountered at Facebook, which typically have any of the following characteristics:

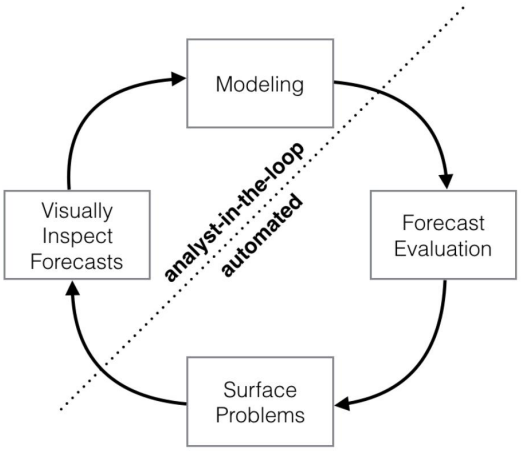
- hourly, daily, or weekly observations with at least a few months (preferably a year) of history
- strong multiple "human-scale" seasonalities: day of week and time of year
- important holidays that occur at irregular intervals that are known in advance (e.g. the Super Bowl)
- a reasonable number of missing observations or large outliers
- historical trend changes, for instance due to product launches or logging changes
- trends that are non-linear growth curves, where a trend hits a natural limit or saturates.

They have found Prophet's default settings to produce forecasts that are often accurate as those produced by skilled forecasters, with much less effort. With Prophet, you are not stuck with the results of a completely automatic procedure if the forecast is not satisfactory — an analyst with no training in time series methods can improve or tweak forecasts using a variety of easily-interpretable parameters. They have found that by combining automatic forecasting with analyst-in-the-loop forecasts for special cases, it is possible to cover a wide variety of business use-cases. The following diagram illustrates the forecasting process they have found to work at scale: Pic 2.

For the modeling phase of the forecasting process, there are currently only a limited number of tools available. Rob Hyndman's excellent forecast package in R is probably the most popular option, and Google and Twitter have both released packages with more specific time series functionality — CausalImpact and AnomalyDetection, respectively.

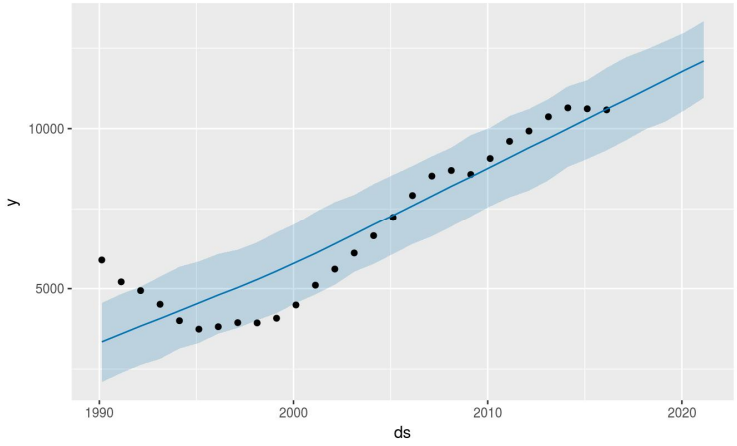
Prophet makes it much more straightforward to create a reasonable, accurate forecast. The forecast package includes many different forecasting techniques (ARIMA, exponential smoothing, etc), each with their own

strengths, weaknesses, and tuning parameters. They have found that choosing the wrong model or parameters can often yield poor results, and it is unlikely that even experienced analysts can choose the correct model and parameters efficiently given this array of choices.



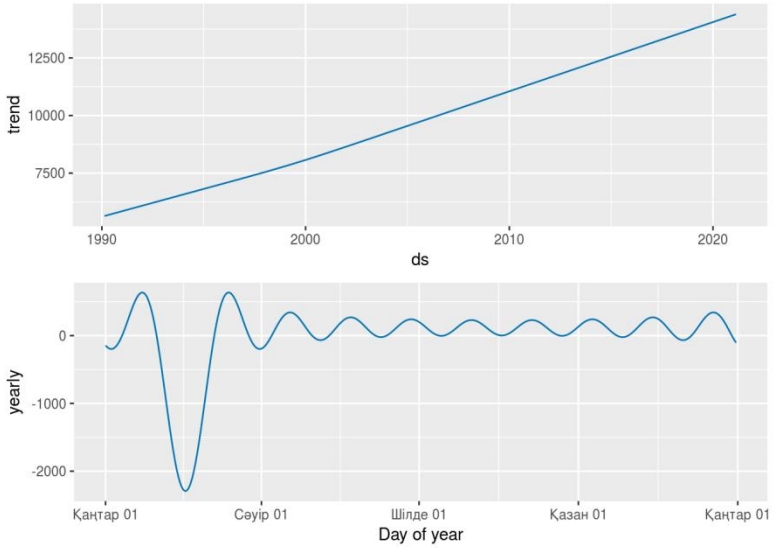
Pic 2. Visual process of Prophet model

Prophet forecasts are customizable in ways that are intuitive to non-experts. There are smoothing parameters for seasonality that allow you to adjust how closely to fit historical cycles, as well as smoothing parameters for trends that allow you to adjust how aggressively to follow historical trend changes. For growth curves, you can manually specify "capacities" or the upper limit of the growth curve, allowing you to inject your own prior information about how your forecast will grow (or decline).



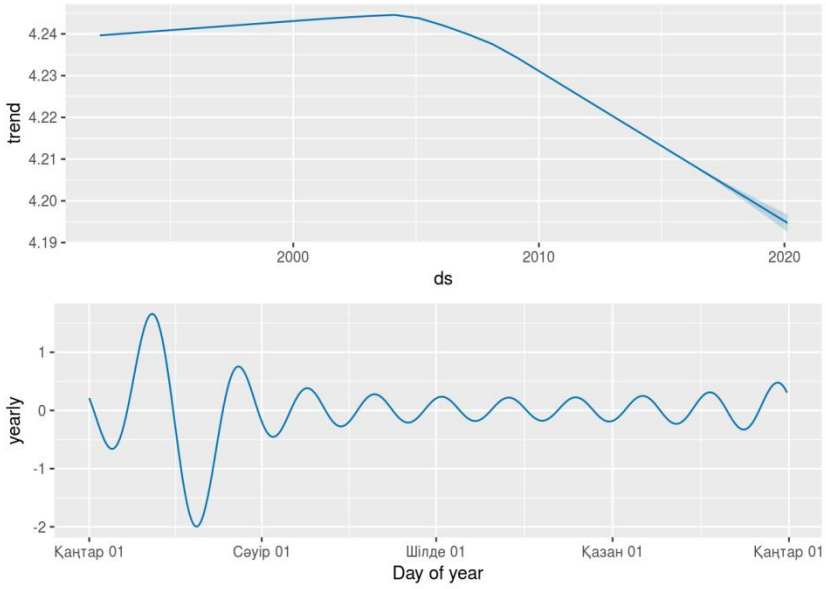
Pic 3. Distribution of factors and prediction for export trade of Kazakhstan

On this graphic we can the development of export trade in Kazakhstan. It starts from 1990 and the prediction was mad till 2020s. Also, we can the development of export trade by months. The period of 1990-2005 was period of formation of the country, and export trade was going down.



Pic 4. Seasonality graphics (year, months)

The important idea in Prophet is that by doing a better job of fitting the trend component very flexibly, They more accurately model seasonality and the result is a more accurate forecast. We prefer to use a very flexible regression model (somewhat like curve-fitting) instead of a traditional time series model for this task because it gives us more modeling flexibility, makes it easier to fit the model, and handles missing data or outliers more gracefully.



Pic 5. Seasonality graphics (year, months)

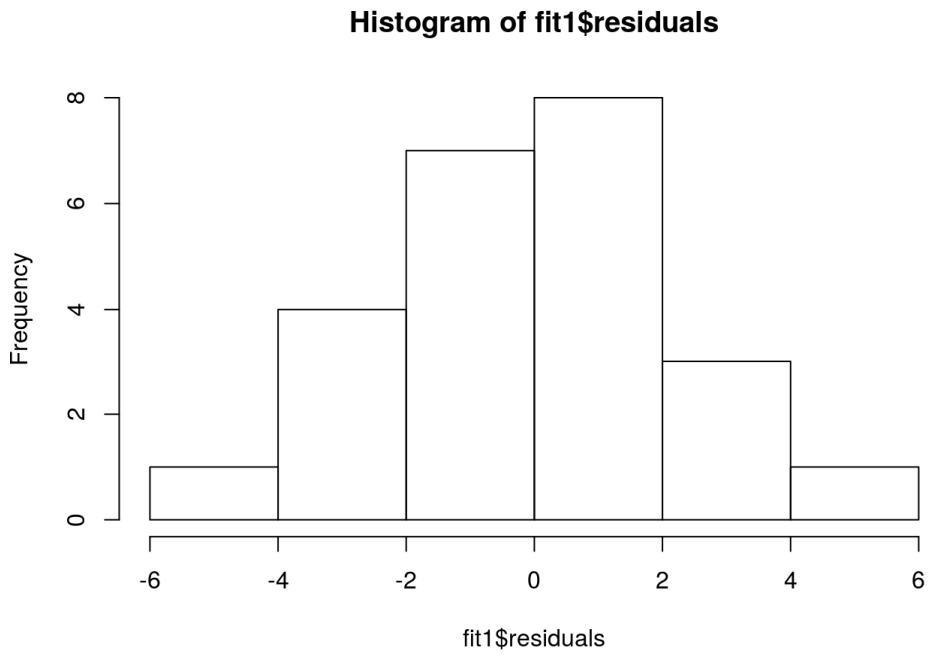
By default, Prophet will provide uncertainty intervals for the trend component by simulating future trend changes to your time series. If you wish to model uncertainty about future seasonality or holiday effects, you can run a few hundred. HMC iterations (which takes a few minutes) and your forecasts will include seasonal uncertainty estimates.

They fit the Prophet model using Stan, and have implemented the core of the Prophet procedure in Stan's probabilistic programming language. Stan performs the MAP optimization for parameters extremely quickly (<1 second), gives us the option to estimate parameter uncertainty using the Hamiltonian Monte Carlo algorithm, and allows us to re-use the fitting procedure across multiple interface languages.

Currently they provide implementations of Prophet in both Python and R. They have exactly the same features and by providing both implementations we hope to make our forecasting approach more broadly useful in the data science communities.

Conclusion

In the Charles' book[5] points out that all theories recognizes that international trade is beneficial to a country, although they lack agreement in their recommendations for government policy. That true as from analysis of many theories there is no specific recommendation for any developing country.

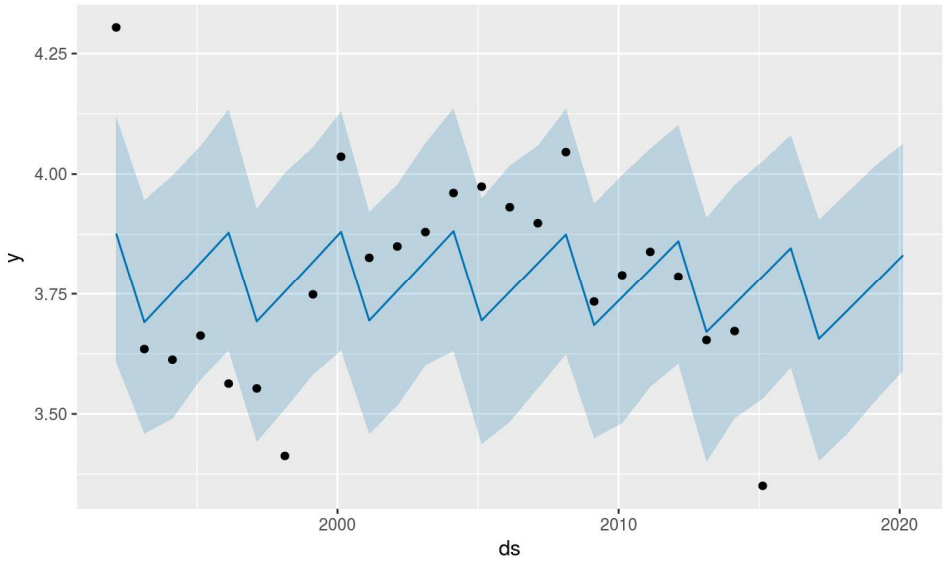


Pic 6. Variance inflation factor

Therefore, the purpose of this article is to provide practical recommendations for the government policy of Kazakhstan, which in turn can lay a foundation for more in-depth analysis and specific country based recommendations.

First, in light of Kazakhstan's absolute advantage in the transit and logistics, why should not Kazakhstan focus on developing and upgrading its transport and logistics infrastructures further and initiate other countries of the region do the same? According to EU Commission [6], China and Europe trade over €365 billion a year and this is not mentioning $230 billion trade between China and Middle East [7], over $250 billion trade of Central Asia, CIS, India and Pakistan with Europe [8], Russia [9,10] and China [11]. By building e ective and advanced logistics systems, Kazakhstan can increase its income from transit services for more than 5-10 billion a year annually. It is known that average growth of world exports of transport [11] equals 5%, insurance services – 8%, communication services – 8% and travel services -6% and generally it is more than average growth rate of GDP of many leading countries.

Second, it is important for Kazakhstan to innovate in building its infrastructures and plants for producing various kind of fuels and energy sources. According to WTO [11], an average annual growth rate of world exports of fuels (1995-2014) increased more than 12%, which is more in value terms than any other product group.



Pic 7. Summary of model (p-value, intercept, adj-R-squared var)

Kazakhstan is number one world exporter of nuclear and it is a main exporter of oil in Central Asia. The significance of specializing in nuclear power technologies and alternative energy sources will add the absolute competitive advantage of Kazakhstan for exporting high value and secure energy technologies and fuels to the neighboring countries in near future.

Third, the three most demanding sectors are pharmaceutical products and foods. They annual growth rate is more than 5%. Kazakhstan with its vast territories and herbage areas is the most favorable environment where government should focus on agricultural and chemical sectors to support those demanding industries.

Forth, it is important for Kazakhstan develop its e-business infrastructure further. is sector accounts for more than 16 trillion of trade a year [11]. It helps to reduce the cost of trade and access markets instantly in any part of the world.

Firth, developing human resources is the key element of growing export potential. With population of around 17 million people, it is important to mobilize resources and increase a number of qualified specialists in key sectors of economy, including those related to supporting industries for export

Sixth, eliminating the informal trade barriers and border controls via implementation of new information and communication technologies. According to the World Bank graph, the required time for import and export are the highest in the Central Asian region. It means that in order to succeed, Kazakhstan should put e orts not only improve its own indicators but also of the region.

Seventh, exporting has certain risks and therefore exporters should have government-backed insurance and incentive programs to cover major types of export risk and stimulate production for outward markets. Such programs particularly useful for new ventures and entrepreneurs who started with small and medium sized businesses for export.

References:

1 CIA World Factbook [internet resourse]. – URL: https://www.cia.gov/redirects/ciaredirect.html (date of use: December, 2006).

2 The Library of Congress [internet resourse]. – URL: https://www.loc.gov/ (date of use: December, 2017).

3 Atlas media [internet resourse]. – URL: https://atlas.media.mit.edu/en/

4 Journal of Statistical Software, July 2008, Volume 27, Issue 3.

5 Hill CWL International business: competing in the global marketplace, 2001.

6 European Commission Trade [internet resourse]. – URL: https://ec.europa.eu/ (date of use: January, 2013).

7 Umut, E. Why is China's role in Middle East is growing ? [internet resourse]. – URL: http://www.hurriyetdailynews.com/why-is-chinas-role-in-the-middle-east-growing-95402 (date of use: June, 2015).

8 Starr, F., Cornell, S., Norling, N. EU, Central Asia, and the Development of Continental Transport and Trade. Central Asia-Caucasus Institute Silk Road Studies Program.-2015.

9 Craig, O. Russia's role and interests in Central Asia [internet resourse]. – URL: file:///C:/Users/ainur.nurasheva/Downloads/russias-role-and-interests-in-central-asia%20(1).pdf

10 Sen, G. India-Russia relations back in spotlight [internet resourse]. – URL: https://www.thedollarbusiness.com/news/india-russia-relations-back-in-spotlight/11825.

11 International Trade Statistics World Trade Organization [internet resourse]. – URL: https://www.wto.org/english/res_e/statis_e/its_e.htm (year of use: 2015).

IRSTI 73.47.12

O. Zholamanuly[1]
[1]Suleyman Demirel University, Almaty, Kazakhstan

LOGISTIC OPTIMIZATIONS. SELF-ADAPTIVE ALGORITHM AND SOFTWARE FOR ROUTING OPTIMIZATIONS

Abstract. The purpose of this research is optimization of transport logistics using algorithms to optimize finding the optimal path and implementing the basic necessary for the logistics company, taking into account the characteristics of the goods. The goal of the work is to create the optimal algorithm for logistic transportation with customized superstructures for goods delivery.

Keywords: logistics, optimizations, algorithm, costoptimizations.

***

Аңдатпа. Бұл зерттеудің мақсаты тауардың сипаттамаларына қарай оларды тиімді жеткізу алгоритмдерін құру арқылы траснсорт компанияларының логистикалық есептерінің оңтайлы шешу жолдарын қарастыру. Тауар жеткізудің арнайы жекеленген әдістерін таңдау арқылы оңтайлы логистикалық жеткізу алгоритмі қарастырылады.

Кілт сөздер: логистика, оңтайландыру, алгоритм, шығынды оңтайландыру.

***

Аннотация. Целью этого исследования является оптимизация транспортной логистики с использованием алгоритмов для оптимизации поиска оптимального пути и реализации основного, необходимого для