Forecasting broadband users in Indonesia

Peramalan pengguna pitalebar di Indonesia

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ABSTRAK

Indonesia has a tremendous opportunity to implement the potential of broadband, as Indonesia has a population of 253 million people and 88.1 million Internet users in 2014. On the other hand, the communication sector (one of them including telecommunications) is the only sector that is consistently contributed to the growth of Gross Domestic Product (GDP) as many as two numbers (double-digit). Then the important role of government is always anticipating in arranging telecommunications regulation, one of them is accelerating the deployment of broadband infrastructure, such as issuing Presidential Regulation Number 96 Year 2014 on Indonesian Broadband Plan 2014 - 2019. In fact, the development of broadband network in Indonesia is still carried out in major cities, considering the telecommunications users are mostly located in large cities. In addition, handset devices or mobile phones, the availability on the market is still limited and the price is still expensive. This study uses a quantitative research methodology to calculate forecasting and qualitatively, by means of observation or direct observation to the field to the company Telkom, Telkomsel, XL Axiata and Indosat. The results of this study showed five factors that influence the use of broadband i.e population, gross domestic product, per capita income, economic growth and inflation, and the rate of broadband penetration. Beside that, the results show that for the next five years, broadband users is increasing.

Keywords*:*
Telecommunications
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ABSTRACT

Negara Indonesia memiliki peluang yang sangat besar untuk merealisasikan potensi pitalebar, mengingat Indonesia memiliki jumlah penduduk 253 juta orang dan pengguna internet 88,1 juta orang pada tahun 2014. Di sisi lain sektor komunikasi (salah satunya termasuk telekomunikasi) merupakan satu-satunya sektor yang secara konsisten memberikan kontribusi pertumbuhan terhadap Pendapatan Domestik Bruto (PDB) sebesar dua angka (*double digit*). Kemudian peran penting pemerintah adalah selalu mengantisipasi dalam membuat regulasi telekomunikasi, salah satu nya untuk mempercepat penggelaran prasarana pitalebar, seperti menerbitkan Peraturan Presiden RI. Nomor 96 Tahun 2014 tentang Rencana Pitalebar Indonesia 2014 – 2019. Secara riil pembangunan jaringan pitalebar di Indonesia masih dilakukan di kota-kota besar, mengingat pengguna telekomunikasi sebagian besar berada di kota-kota besar. Selain itu perangkat hanset atau *handphone*, ketersediaan di pasaran masih terbatas dan harganya masih mahal. Kajian ini menggunakan metodologi penelitian kuantitatif dengan menghitung *peramalan* dan kualitatif, dengan melakukan observasi atau pengamatan langsung ke lapangan kepada perusahaan Telkom, Telkomsel, XL Axiata dan Indosat. Selanjutnya hasil penelitian ini diperoleh lima faktor yang mempengaruhi penggunaan pitalebar yaitu jumlah penduduk, produk domestik bruto, pendapatan per kapita, laju pertumbuhan ekonomi dan inflasi, dan laju penetrasi. Selain itu, hasil pitalebar menunjukkan pengguna pitalebar lima tahun kedepan selalu meningkat.

1. Introduction

Indonesia is the world's fourth populous nation with total population of 253 millions in 2014 and the fifth with the largest social media users, the fourth for largest facebook users and fifth for largest twitter users. In

addition, the Indonesian demography from aspects of youth population aged from 10 to 24 years are potential in adopting technologies that reach approximately 20% of the total Indonesian population of about 50.6 million. Furthermore, Indonesia has market potential of 4.5 million Civil Servants; 50 million students; 3 million educators; 60 million households connected (Rudiantara, 2014). Indonesia has a tremendous opportunity to realize the potential of broadband. The communication sector is the only sector that consistently has contributed to the growth of Gross Domestic Product (GDP) of two digits (double-digit). One of the important roles is government in making regulations as contained in the milestone of telecommunications regulation development, that is broadband network construction that had been started before 2010 by PT. Telekomunikasi Indonesia. Certainty of funding support from the government through the Commission funds (Universal Service Obligation) was given in 2012 to accelerate performance of broadband infrastructure. (Ministry of Planning/Bappenas, 2014:24). Presidential Regulation No. 96 Year 2014 on the Broadband Plan Indonesia from 2014 to 2019 states that in order to realize independent, advanced, just, and prosperous Indonesian people which is the vision of national long term development plan of 2005-2025 and one form of implementation of the Indonesia's economic development acceleration and expansion masterplan 2011-2025, it is required the use of information and communication technologies, especially broadband as an integral part of a strategy to boost economic growth and national competitiveness and improve the quality of life in Indonesia. Furthermore, in Article 1 in the Presidential Regulation, tha intended wideband or broadband is internet access with guaranteed connectivity that is always connected, guaranteed durability and security of information, and the ability of triple-play with a minimum speed of 2 Mbps (megabits per second) for fixed access and 1 Mbps (megabits per second) for mobile access.

National broadband development should be done to improve national competitiveness and quality of life in Indonesia. The innovative, comprehensive, and integrated development pattern is indispensable to accelerate the construction of Indonesia’s broadband ecosystem and breakthrough of ICT development pattern in Indonesia is needed to catch up with other countries. (Annex of President Regulation 96 2014). Deployment and adoption of broadband technology will enhance the level of productivity, and in turn it will stimulate economic growth (Marcelo Grosso, 2006: 2).

Based on data from the Central Bureau of Statistics, the national income per capita in 2012 was US $ 30.89 million (very provisional figures) or about Rp 2.57 million per month with an average amount of spending per month for a household of education is Rp 24,679, health is Rp 19,588, and electricity is between Rp 90,000 and Rp 110,000. For economic corridor of Java island, the lowest price of connection of 512 kbps (kilobits per second) reached up to Rp 600,000, equivalent to 23% of income per month, while the highest price was Rp 13 million per month. Thess figures was much higher than the average amount of spending for basic household needs (education and health). While on the economic corridor of Java island, the lowest price of 1 Mbps connection reached Rp. 700,000, - per month, while the highest price reached Rp. 15.4 million per month. The service price of wireless access mentioned above was still quite expensive compared to spending on education, electricity and health (Ministry of Planning/Bappenas, 2014: 33).

To find out the needs of broadband demand in the future minimal medium term from 2016 to 2020, a forecasting or projection is required to determine the demand forecast for the year.

Based on the data above, it is necessary to do research on forecasting the use of broadband in Indonesia and determine the factors that influence broadband users demand.

2. Literature review

2.1. Method of forecasting

According to Fandy Tjiptono (2012: 235-236), forecasting reflects a prediction or projection of something that will happen in certain conditions and situations. Forecasting is simply to predict what happens in the

future. Forecasting technology is the process of predicting the characteristics of the future with the development of technology (Abhaysinh V. Surve, 2014: 5). Forecasting is a key element in the process of business planning and marketing strategy planning. One of the most important elements for forecasting business is forecasting demand. Measurement of market demand requires a deeper understanding of the relevant market being served. The size of the market depends on the number of potential buyers who might be interested in buying a particular product or service. Characteristic of potential buyers is characterized by three aspects: interest, income (purchasing power), and access.

Forecasting composers of a product or service sales are three stages: (1) environmental forecasting, (2) industrial demand forecasting and (3) the company's sales forecasting. Environmental forecasting includes projections of inflation, unemployment, interest rates, consumer spending and savings, business investment, government spending, exports and imports, and also other important relevant environmental events. The result is an indicator of Gross National Product (GNP) which is then integrated with other indicators to predict industry sales. Furthermore, the company compiled its sales forecast by assuming certain share (percentage) of industry sales.

Broadly speaking, there are several methods used to determine the results of forecasting in future periods, namely:

1. Moving Average

   The moving average (moving average) for period is the average value for n number of the latest data. With the advent of new data, the average value can be calculated by eliminating the oldest data and adding new data. Moving average model is best suited for stationary data, ie if the data fluctuates around the average. But this method does not work well for data that contains trend, i.e. if there is an increase or decrease in long-term secular data. In addition, this method is less optimal for data that contains seasonal pattern.

2. Single Exponential Smoothing

   Single exponential smoothing method is used if the data is not significantly affected by trend and seasonal factors. If the data is stationary, then using single smoothing is a fairly good approach. However, if there is a trend, this method is not good enough. Each data is given a certain weight, and the weight of more recent data is heavier than the older data.

   The general form of single smoothing method equation:

   $Ft + 1 = \alpha Xt + (1-\alpha) Ft$

   Where :

   X_t = new data

   α = factor/smoothing constant

   F_{t+1} = forecast for period t

   F_t = forecast for period t-1

   With the initialization F2 = X1

   Smoothing constant α serves as a weighing factor. If you have value close to 1, the new forecast would include a large error adjustment in the previous forecast. Conversely, if α is close to 0, then the new forecast would

   include very small adjustments. The value of α which produces the smallest error rate (optimum) will be selected in the forecasting process. To find out the most optimum α value, a simulation or trial and error method can be used.

3. Double Exponential Smoothing

   Double exponential smoothing method (Double exponential smoothing) smoothen trend values with different parameter of the parametersused in the original series. Predictive value of exponential smoothing is obtained by using two smoothing constants ie α and γ, with ($0 <\alpha, \gamma <1$).

In a Double Exponential Smoothing, method used are:
Method 2 Parameter Holt
→ Used for data that contains tren
$S_t = \alpha X_t + (1- \alpha) (S_{t-1} + b_{t-1})$
$b_t = \gamma (S_t – S_{t-1}) + (1- \gamma) b_{t-1}$
The equation used to make predictions on the coming period is:
$F_{t+m} = S_t + b_t . m$
Where :
S_t = exponential smoothing value
α = smoothing constant for data ($0 \leq \alpha \leq 1$)
β = smoothing constant for trend estimation ($0 \leq \beta \leq 1$)
X_t = actual value in period t
b_t = trend estimation
m = number of periods ahead that will be predicted
initialization:
$S_1 = X_1$
$b_1 = X_2 - X_1$ → estimate of slope after the data is plotted

4. Triple Exponential Smoothing

Triple exponential smoothing method is known as winter method. This winter method can overcome the seasonal data problem that can not be overcome by the moving-average method described in the previous section. This method is based on three smoothing equations and an equation to calculate the value of forecasting. Triple smoothing equations include one equation to overcome the stationary elements, one equation to overcome the trend element, and one equation to solve seasonal elements. Based on the 3 smoothing equations, namely: for the stationary, for trends, and for seasonal element.

The general forms used to calculate the forecast are:

a. exponential smoothing $S_t = \alpha \frac{X_t}{Y_{t-L}} + (1-\alpha)(S_{t-1} + b_{t-1})$

b. Trend estimation $b_t = \beta(S_t - S_{t-1}) + (1-\beta)b_{t-1}$

c. Seasonal estimation $Y_t = \mu \frac{X_t}{S_t} + (1-\mu)Y_{t-L}$

d. The equation used to make predictions on the coming p period $F_{t+m} = (S_t + b_t m)Y_{t-L+m}$

is:
Where :
S_t = exponential smoothing value
α = smoothing constant for data ($0<\square<1$)
β = smoothing constant for trend estimation ($0<\square<1$)
μ = smoothing constant for seasonal estimation
X_t = actual value in period t
b_t = trend estimation
Y_t = seasonal estimation
L = length of the season
m = number of periods ahead that will be predicted

2.2. Previous researchs

According to Kasmad Ariansyah (2014) in a paper entitled Proyeksi Jumlah Pelanggan Telepon Bergerak Seluler di Indonesia (Projected Number of Cellular Mobile Telephone Subscribers in Indonesia), the projected growth in the number of mobile cellular telephone subscribers is an important thing because it will affect the company's decision in business planning and marketing planning. This paper projected cellular mobile telephone subscribers, teledensity projections and Indonesia's population projections by using time series method. With time series analysis, we know the need of mobile cellular phone users in the future in the period from 2013 to 2018 which experiences a positive growth from year to year.

Charisios Christodoulos, Christos Michalakelis, Dimitris Varoutas (2010) in their paper Forecasting with Limited Data: Combining ARIMA and Diffusion Models, said that forecasting new technologies such as the advent of broadband technology, is usually done by a diffusion model. This paper presents a new methodology that focuses on improving short-term prediction that combines the advantages of both approaches and that can be applied in the early stages of the diffusion process. Application of this methodology provides short-term forecast for the broadband and the mobile telecommunications penetration. The result of this study shows prediction for next one year. Diffusion model is typically used to obtain estimates of the future.

Yongil Jeon, Kwang Hyun and Clive R. W. J. Granger (2004) in their paper Forecasting Long-Term Technological Forecasting, said that the Chinese telecommunications can be constructed with few expectations. Chinese population density combined with urbanization ratio will show a positive association with the use of cell phones per 100 inhabitants. Higher incomes level will also be a positive factor for the growth of mobile telecommunications. China has experienced double-digit economic growth in history, what will expect to lead to an increase in the use of mobile phones in the near future. This paper predicted the development of Chinese cell phone subscribers had increased from 2000 to 2003 where the number of mobile phones per 100 people had increased from 6.671% to 20.879%. In addition, mobile phone users had increased from 37.1% in 2000 to over 50% in 2003. China is not only a developing country where we expect a significant increase in service mobile phone use, and this opens up many opportunities for the future.

2.3. Research Conducted Today

Research being done at this time is entitled Forecasting *Permintaan Pengguna Broadband di Indonesia* (Forecasting Broadband Users Demand in Indonesia). This study is not the first time, but has ever been done, both domestically and abroad, especially about forecasting. Although it is associated with other problem varieties. This study uses time series analysis techniques, particularly double exponential method and multiple regression. For knowing the stages of study, it can be seen in the next section.

3. Method

This study uses quantitative research methods approach supported by qualitative research. Quantitative study does forecasting calculations. Meanwhile, qualitative research does observation. Quantitative research technique is done by taking a purposive sampling of the entire population of telecommunication operators as many as 3 (three) mobile telecommunication operators and 1 (one) cable telecommunication operators. Data were obtained from the Central Bureau of Statistics and by conducting FGD (Focus Group Discussion) with the participants that are managers of PT. Telkom Tbk., PT.Telkomsel Tbk., PT.Indosat Tbk., PT. XL Axita Tbk, academics represented by the University of Indonesia, Mastel and Regulators represented by the Directorate General of SDPPI. Furthermore, data analysis with forecasting and descriptive analysis is done. Forecasting analysis technique uses 2 (two) models, namely: 1) technique of multiple regression is used to determine the correlation between independent variable and the dependent variable. Relationship to the two variables is strong/positive or weak/negative with analytical calculations SPSS 2) exponential smoothing, a second analysis

used in this study is the exponential smoothing. This analysis is conducted to obtain the pattern of growth in the past by assuming that the same pattern will be repeated in the future. The first step is to do testing whether there is a trend in the data. If there is a trend in the data, analysis of linear trend, quadratic, exponential and autoregressive will be done. If there is no trend in the data, the data will be analyzed using the method of exponential smoothing and moving averages. In this study, analysis is only conducted by using exponential smoothing. Furthermore, to determine the most appropriate analysis is done by looking at the error value of each method used. Method with the smallest error will be used for forecasting the broadband users in Indonesia.

4. Result and Discussion

4.1. Telecommunications Industry Agent

Telecommunication industry agents entered 2014 with optimism that the telecommunications market will continue to grow supported by economic growth in Indonesia that was relatively resilient to the global crisis and supported by good political stability. The market share of telecommunications in the country remained very promising. Telecommunications in Indonesia dominated and controlled cellular market in Indonesia with the number of subscribers at the end of 2013, ie 3 (three) mobile telecommunications operators: PT. Telkomsel Tbk. as many as 131,513 million (Telkomsel, 2013), PT. XL Axiata Tbk. as many as 60,172 million (XL, 2013) and PT. Indosat Tbk. as many as 59,6 million (Indosat, 2014). The three mobile telecommunications operators set prices and other competitive strategies. The rest, with the number of customers under 20 million subscribers, is PT. Smartfren Telecom Tbk. with 11.332 million sebscribers.

According to Nonot Harsono, a Member of Indonesian Telecommunications Regulatory Agent/ Badan Regulasi Telekomunikasi Indonesia (BRTI), today Indonesia is recorded as the country with the largest cellular telecommunications providers in the world compared to the population, because there are 10 player operators either GSM (Global System for Mobile Communications) or CDMA (Code Division multiple Access).

In another perspective, the Internet service has now become the basic needs of people. Number of Internet users in Indonesia is growing rapidly supported by more affordable Internet connection costs, widespread use of smartphones and the availability of a variety of innovative content and Internet applications. Until 2014, Internet users in Indonesia was estimated to have reached 72.7 million people. Most of them are social media users such as facebook, twitter, line and path. Encouraging fact is according to research from Redwing, nearly 90% of Internet users in Indonesia access the Internet through mobile devices. Availability of fast and stable internet connection is the main needs of users. However, people's expectations seems not yet fully achieved. A study in the second quarter of 2013 reported that Internet connection speeds average in Indonesia was only 1.5 Mbps. Within ASEAN (Association of South East Asian Nations), the speed was still less compared with Singapore (7.8 Mbps), Thailand (4.7 Mbps), Malaysia (3.2 Mbps), Vietnam (2 Mbps) and Philippines (1.8 Mbps).

Agents of the telecommunications business have prepared to apply the fourth-generation technology called 4G. 4G technology offers all kinds of services with the advantages of a wider range, much higher data speed, affordable prices and ability to provide comprehensive IP-based solutions. This creates opportunities for mobile telecom operators, to expand more modern data services business (XL Axiata, 2013: 61-62).

Telkom with its main business that is cable-based telecommunication services developed broadband via fiber-optic network. Telkom developed optical fiber-based access networks, which until the end of 2014 reached 13.2 million homes passed which will further roll out fiber-optic connections to homes and buildings (fiber to the home/building) to revive the fixed line business. Contributions for segment of data, internet and IT increased to 32.5% from 28.2% in the previous year. Broadband fixed line services in Telkom is sipported by

superior network backbone. Until the end of 2014, Telkom had built optical fiber-based backbone network along 76 700 km. Telkom continued to build a backbone network throughout the archipelago.

Telkom has 9.7 million cable fixed line subscribers and 4.4 million wireless fixed line subscribers, and 3.4 million fixed broadband subscribers. We also provide a variety of other communication services, including multimedia services, data and services related to Internet communications, satellite transponder leasing, subscriptions circuit, interconnects, cable television and VoIP (Voice over Internet Protocol), as well as running the multimedia business, such as content and applications.

In 2014, Telkom promoted fixed wireline business by offering fixed broadband and IPTV (Internet Protocol Television) service as parts of product bundling. Fixed broadband is a non-mobile broadband internet service, which uses ADSL (Asymmetric Digital Subscriber Line) and fiber optic cable, with the commercial name "Speedy" (Speedy Products has been re-branded to "IndiHome" which is the services of triple play bundling). In addition, Telkom also provides broadband internet service Pay As You Used (on demand internet) that is broadband internet services on-demand by utilizing speedy and Wi-Fi (Wireless Fidelity) access with the commercial name "Speedy Instan" (Telkom, 2014). Telkomsel officially launched first commercial mobile services 4G LTE (Long Term Evolution) in Indonesia. Telkomsel 4G LTE services have access data speeds up to 36 Mbps. As a 6th largest service provider number in the world in terms of number of customers, in an effort to guide the development of the mobile telecommunications industry in Indonesia entering a new era of mobile broadband services, Telkomsel consistently implements the technology roadmap of 3G, HSDPA (High Speed Downlink Packet Access) HSPA + (High Speed Packet Access Plus), as well as Long Term Evolution (LTE) trial technology. Telkomsel is now developing broadband networks in 100 major cities in Indonesia. In 2014, Telkomsel also continued development of broadband networks in line with the technology roadmap through the expansion of network capacity, coverage and quality programs. On December 31, 2014, Telkomsel had developed about 15,500 new BTS (Base Transceiver Station), that 76% of it was 3G BTS or NodeB, and 186 LTE BTS or e-NodeB (Evolved NodeB) deployed to Jakarta and Bali. Our development strategy is based on geographic base stations, divided into groups and POI (Points of Interest) based on spots, such as public facilities, schools and campuses, tourist areas, etc. (Telkomsel, 2013).

XL aims middle class market segment (emerging middle class) that consists of people who are just starting to work, young and dynamic. They really need data services to access a variety of information resources and fulfill the desire to connect in the business and social community. It is an appropriate strategy considering that Indonesian middle class growing is outstanding. The number of middle class people increased from 37% of the total population of Indonesia in 2004 to 56.7% in 2013. With a population of Indonesia in 2013 which reached 251 million, it means that by 2014 the number of Indonesia's middle class reached more than 125 million people.

XL views that the increase in the middle class has a correlation to the growth of the data segment. More and more customers integrate application-related data into their lives and daily activities. In line with the growth of the middle class, purchasing power for mobile devices and mobile devices that support the use of data services is also increasing. XL continues to innovate in developing the data segment by presenting digital value-added services such as digital entertainment, mobile advertising, mobile payment, mobile money, machine to machine (M2M), e-commerce and cloud. Basically, XL wants to provide data services which are qualified by emphasizing the principle of "value for money" for the customer.

Providing Internet connections at affordable rates is a challenge in the midst of intense competition in the telecommunications industry. Various efficiency measures are made continuously to produce a reasonable price. We do everything in order to become a super low cost company. On the other hand, the investment for the modernization of infrastructure and network expansion must still be done to improve the quality of service. The addition of the spectrum will support XL’s efforts to improve service quality and better network including support XL's ability to compete in the 4G-LTE at 1800 MHz frequency. As for customers, they will get benefit

from the availability of new service varieties that support their digital lifestyle and benefit from the larger community created, better distribution, and a wider range.

Indosat applies 4G-LTE Super Network technology that is the fastest wireless network successor to 3G networks with new standards to increase the capacity and speed of the network. 4G-LTE uses different technology than the 3G. Network access speed of Indosat Super 4G-LTE is up to 185 Mbps (download) and up to 41 Mbps (upload) (Indosat, 2013).

Results should be clear and concise and not in the form of raw data. Discussion should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature. BPostel will do the final formatting of your paper.

4.2. Variable of Broadband Using Forecasting

The results of field data collection of study site will be explained below, but before that, we describe data for all of Indonesian regarding broadband users and factors that influence it such as the population of Indonesia, the Gross Domestic Product (GDP), per capita income, economic growth and inflation , presented in table 1.

Table 1. Variable of Forecasting Broadband Users in Indonesia

Year	Users (Thousands)	Population (Thousands)	PDB (Million)	per capita income (Thousands	Economic Greowth (%)	Inflation (%)	Penetration Rate (%)
2005	16.000	219.852	2.774.281.100	11.179.5	5,69	17,11	25.00 %
2006	20.000	222.192	3.339.479.600	13.196.2	5,50	6,60	10.00 %
2007	20.000	225.642	3.950.893.200	15.416.8	6,35	6,59	13.64 %
2008	25.000	228.523	4.271.044.600	19.509.1	6,01	11,06	20.00 %
2009	30.000	230.870	4.653.539.200	20.974.9	4,63	2,78	40.00 %
2010	42.000	237.641	6.446.851.900	23.974.4	6,22	6,96	30.95 %
2011	55.000	241.134	7.419.187.100	27.487.0	6,49	3,79	14.55 %
2012	63.000	245.138	8.229.439.400	30.674.7	6,23	4,30	14.13 %
2013	72.000	248.818	9.083.972.200	32.463.7	5,78	8,38	22.67 %

Sumber: BPS 2014 dan APJII 2014

4.3. Factors Affecting the Broadband Users Forecasting

4.3.1. Population

Indonesia's population growth average rate from 2005 to 2013 is 1.39% and 1.49% per year according to the results of the population census 2010. The population growth of Indonesia nationally is still relatively fast, it can be seen every year that the birth rate is getting increased. On the other hand, a large population is a large market share for telecom operators, especially between the ages of 5 years up to 60 years in using broadband.

People of a country becomes the most important factor in the implementation of development because they will be the subject and object of development (Randy Suryoranu, 2014).

According to projections made by the United Nations (UN) by viewing Indonesia absolute population in the future, then this country will have a population of more than 250 million people in 2015, more than 270 million people in 2025, more than 285 million people in 2035 and 290 million in 2045. Only after 2050,

Indonesia's population will be reduced. According to UN projections, by 2050 two-thirds of Indonesia's population will live in urban areas. Since 40 years ago, Indonesia is undergoing a rapid urbanization process that is why now about half of Indonesia's total population lives in urban areas. This process showed a positive development for Indonesian economy because urbanization and industrialization will create economic growth further and make Indonesia as the country with middle to upper income levels (Indonesia Investments, 2015).

4.3.2. Gross Domestic Product (GDP)

Gross National Product (GNP)/Gross National Product (GNP) is the sum of goods and services produced by factors of production owned by the state whether they live in the country and abroad, but does not include citizens of foreign countries who live in the country. One important indicator to determine the condition of the economy in a country in a certain period is data of Gross Domestic Product (GDP), at current prices and at constant prices. GDP is basically the total value added generated by all business units within a particular country, or a total value of final goods and services produced by all economic units.

GDP at current prices illustrates the added value of goods and services that is calculated using prices prevailing at each year, while GDP at constant prices shows the value-added goods and services calculated using the prices prevailing in the base year. GDP at current prices could be used to see economic shifts and structures, while constant prices could be used to determine the price of economic growth from year to year. Indonesia's economy measured by the amount of the Gross Domestic Product (GDP) at current prices prevailing in second quarter of 2015 reached Rp 2866.9 trillion and at constant prices of 2010 reached Rp 2239.3 trillion (CBS, 2015).

4.3.3. Per Capita Income

Per capita income is the amount of average income of the population in a country that is obtained from the divion of the national income of a country with the population of the country. Typically, the income per capita is often called the Gross Domestic Product (GDP) per capita (CBS, 2014). Per capita income is often used to measure the prosperity of a country. The greater the per capita income is, the country will be considered more prosperous. The average per capita income of Indonesia population in 2013 was amounted to Rp 32,463,700 per year or Rp 2,705,308 per month. Although economic growth was getting slower from year to year, the government in 2015 had raised the regional minimum wage (RMW) to Rp 3.1 million. Per capita income shows the purchasing power of people to meet life necessities.

4.3.4. Economic Growth

Economy of Indonesia in the third quarter of 2015 to the third quarter of 2014 (y-on-y) grew 4.73 percent. It is increased compared to the second quarter of 2015 which grew 4.67 percent. Growth was supported by almost any field of business, with the highest growth achieved in the Field of Information and Communications which grew 10.83 percent (CBS, 2015). Indonesia's economic growth of late 5 (five) years from 2011 to 2015 showed a decline or slowdown, ie: 2011 by 6.49%, 2012 by 6.23%, 2013 by 5.78%, 2014 by 5.03, and 2015 by 4.67%.

Indonesia economy spatial structure in the second quarter 2015 was dominated by group of provinces in Java and Sumatra islands. Group of provinces in Java provided the largest contribution to the GDP, by 58.35%, followed by Sumatra island by 22.31%, and Borneo island by 8.22%. The better a country's rate of economic growth, the higher purchasing power of people or users. As a result, welfare was increased. Along with the growing economy, the Indonesian public revenue was increasing too. The number of poor decreased and the number of middle people increased.

4.3.5. Inflation

Inflation is rising prices of goods and services in general, where goods and services are basic needs of people or a decline in purchasing power of a country's currency. If the price of goods in general rises continuously, then the public will panic so that the economy is not running normally, because on one hand people with excessive money can buy goods, while the people with lack of money can not buy goods. As a result the country is vulnerable to all sorts of chaos. On the other hand, when inflation is prolonged, then many manufacturers go bankrupt because of its products will relatively be more expensive that nobody can afford to buy. It includes information and communications technology (ICT) Products, also broadband products. Looking at the report of the CPM, the contribution of ICT to inflation is low but public purchasing power is declining. It will also affect ICT products. Inflation result in general is the declining purchasing power, because the level of revenue is also declining in real. So, suppose that the amount of inflation during the year rises by 5% while income is constant, it means that in real revenues is decreasing relatively by 5% and consequently will reduce the purchasing power by 5% as well (Putong, 2002: 254). To determine the factors that influence Forecasting Broadband Users in Indonesia, the factor analysis test is conducted. The data used is the data coming from the Central Bureau of Statistics and a survey conducted by the Association of Indonesian Internet Service Provider (APJII) 2014. The results of the correlation analysis between these variables are presented in Table 2.

Table 2. Table Correlation Between Variables

		Zscore (Users)	Zscore (Number of_Population)	Zscore (Economic_rate)	Zscore (PDB)	Zscore (Inflation)	Zscore (Per_capita_income)	Zscore (penetration)
Correlation	Zscore (Users)	1.000	.982	.441	.991	-.346	.972	.987
	Zscore (Number of_Population)	.982	1.000	.479	.996	-.388	.995	.987
	Zscore (Economic_ rate)	.441	.479	1.000	.503	.080	.464	.391
	Zscore (PDB)	.991	.996	.503	1.000	-.374	.986	.987
	Zscore (Inflation)	-.346	-.388	.080	-.374	1.000	-.399	-.349
	Zscore (Percapita_income)	.972	.995	.464	.986	-.399	1.000	.974
	Zscore (penetration)	.987	.987	.391	.987	-.349	.974	1.000
Sig. (1-tailed)	Zscore (Users)		.000	.101	.000	.164	.000	.000
	Zscore	.000		.081	.000	.134	.000	.000
(Users)		.101	.081		.069	.413	.089	.132
	Zscore (Economic_Rate)	.000	.000	.069		.143	.000	.000
	Zscore (PDB)	.164	.134	.413	.143		.127	.162
	Zscore (Inflation)	.000	.000	.089	.000	.127		.000
	Zscore (percapita_income)	.000	.000	.132	.000	.162	.000	
	Zscore (penetration)							

In Table 2 above, it can be seen that the correlation between broadband users with variable per capita income, population and gross domestic product and variable broadband penetration is very strong and positive. While the correlation with the rate of inflation is negative. Thus, we can interpret if the value of per capita income, population, gross domestic product, the economy and the penetration rate of broadband are higher, the broadband users will further increase, while if inflation is higher then broadband user is less.

Then in line sig. (1-tailed) showed significant correlation between these variables. The correlation between the broadband variable per capita income, gross domestic product, population, and the rate of penetration of broadband significantly, is visible from p-value of each variable which is less than the value of 0.05 which means that there is indeed a relationship between these variables with increasing broadband users, while the pace of economic and inflation is not significant in influencing the growing number of broadband users.

4.4. Forecasting Broadband Usersin Indonesia

To get the forecast number of broadband users in Indonesia, historical data of the number of Internet users in the past is required. In this study, the broadband users of historical data is obtained from the results of a

survey conducted by the Association of Indonesian Internet Service Provider in 2014. Growth in the number of Internet users in Indonesia is presented in Table 3.

Table 3. Number of Broadband Users 2004-2014

Year	Total Users	Penetration
2004	11200000	
2005	16000000	42.86 %
2006	20000000	25.00 %
2007	22000000	10.00 %
2008	25000000	13.64 %
2009	30000000	20.00 %
2010	42000000	40.00 %
2011	55000000	30.95 %
2012	63000000	14.55 %
2013	71900000	14.13 %
2014	88100000	22.67 %

Source: (APJII, 2014)

In the form of graphs, scatter plots, data of the broadband users number in 2004 to 2014 is shown in Figure 1 below. Broadband Users scatterplot 2004-2014

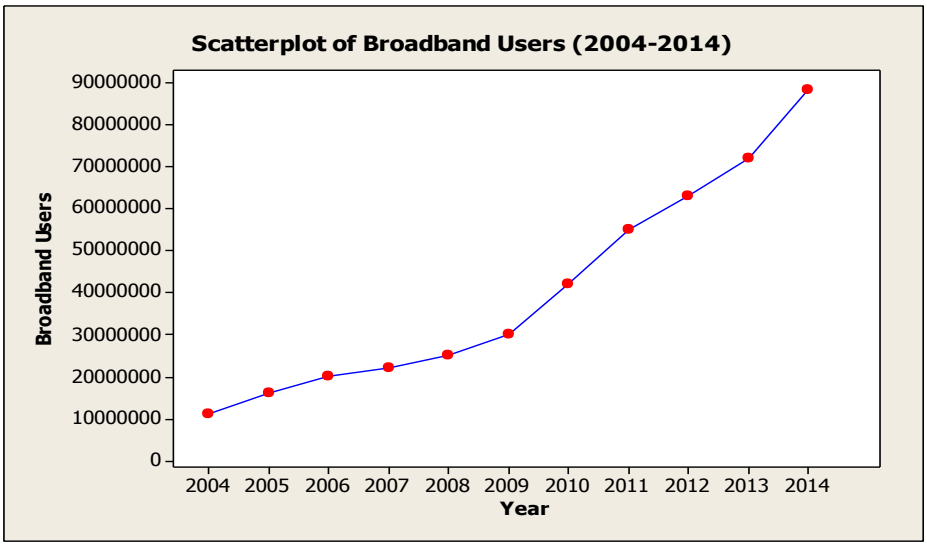

Figure 1. Number of Broadband Users 2004-2014

Before determining that the analytical techniques is used appropriately or not, we must first conduct unit root test.

Table 4. Root Tests of Broadband Users Unit

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.133275	0.9815
Test critical values:	1% level	-5.295384	
	5% level	-4.008157	
	10% level	-3.460791	

*MacKinnon (1996) one-sided p-values.

In Table 4, we can see that the t-Statistic value of Augmented Dickey-Fuller (0.133275) is still less than the critical values either at the level of 1%, 5%, or 10%, this indicates that the data is not stationary.

Table 5. Test of Broadband User Trends

Variable	Coefficient	Std. Error	t-Statistic	Prob.
PENGGUNA(-1)	-0.027203	0.204114	-0.133275	0.8977
C	850714.8	2304765.	0.369111	0.7230
@TREN("2004")	1419636.	1427884.	0.994223	0.3532

R-squared	0.617552	Mean dependent var	7690000.
Adjusted R-squared	0.508281	S.D. dependent var	4764790.
S.E. of regression	3341198.	Akaike info criterion	33.12488
Sum squared resid	7.81E+13	Schwarz criterion	33.21566
Log likelihood	-162.6244	Hannan-Quinn criter.	33.02530
F-statistic	5.651570	Durbin-Watson stat	1.573419
Prob(F-statistic)	0.034594		

Based on table 5, we can see that the t-statistic of the trend (0.994223) is greater than the confidence level of 1%, 5% or 10%. This shows that the trend is not significant or have no data trends. From the analysis in Table 4 and Table 5, it can be seen that the data is not stationary and the data does not have a trend, then the data can be analyzed using two techniques of analysis, moving average and exponential smoothing. In this study, forecasting broadband users in Indonesia will use exponential smoothing analysis techniques.

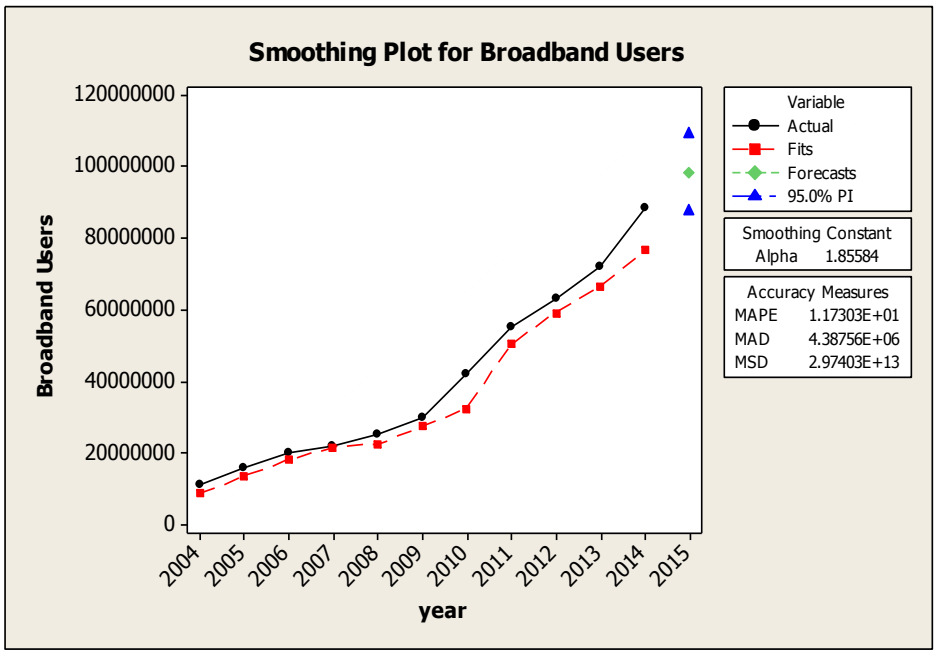

Figure 2. Forecasting Broadband Users with Single Exponential Smoothing Methods

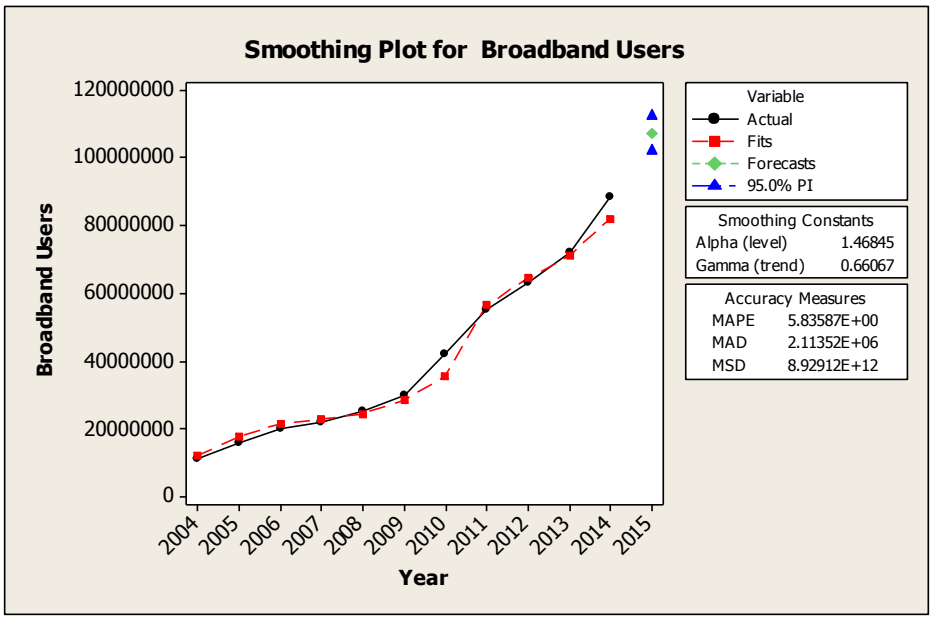

Figure 3. Forecasting Broadband Users with Double Exponential Smoothing Methods

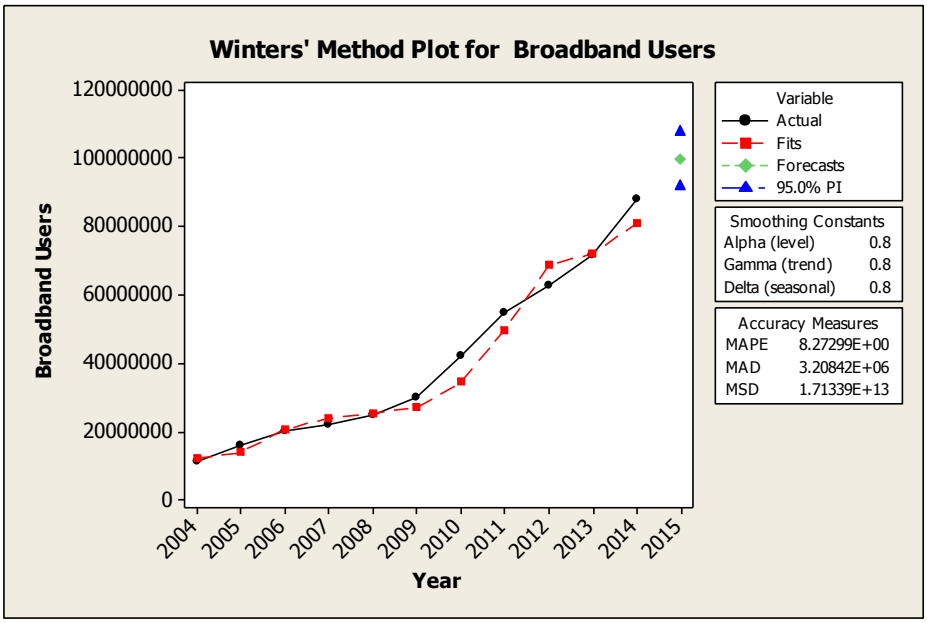

Figure 4. Forecasting Broadband Users with Triple Exponential Smoothing Methods

Based on analysis of three exponential smoothing techniques as seen in Figure 2, Figure 3 and Figure 4, value of the error is obtained as shown in Table 6.

Table 6. MAPE, MAD and MSD

Teknik Analisis	MAPE	MAD	MSD
Metode *single exponential smoothing*	1.17303E+01	4.38756E+06	2.97403E+13

Teknik Analisis	MAPE	MAD	MSD
Metode *double exponential smoothing*	5.83587E+00	2.11352E+06	8.92912E+12
Metode *triple exponential smoothing*	8.27299E+00	3.20842E+06	1.71339E+13

By looking at the accuracy of each method of forecasting using exponential smoothing, that is by looking at the error value shown in Table 2, it is known that the the smallest value of MAPE (Mean Absolute Percentage Error), MAD (Mean Absolute Deviation) and MSD (Mean Square Deviation) is resulted by the double exponential smoothing method. Thus, the double exponential smoothing method is selected as the best method for getting the forecast number of broadband users in the future.

Table 7. Forecasting Broadband Users

Tahun	Data	St	bt	F
2004	11,200,000	11,200,000	4,800,000	
2005	16,000,000	16,000,000	4,800,000	
2006	20,000,000	19,803,984	4,335,458	20,800,000
2007	22,000,000	21,475,794	3,093,133	24,139,442
2008	25,000,000	25,105,622	3,343,447	24,568,926
2009	30,000,000	30,380,009	4,244,038	28,449,069
2010	42,000,000	43,807,256	8,527,086	34,642,047
2011	55,000,000	55,653,139	10,074,973	52,334,343
2012	63,000,000	62,331,558	8,490,820	65,728,113
2013	71,200,000	71,292,525	8,710,097	70,822,378
2014	88,100,000	90,084,020	13,412,061	80,002,622
2015				103,496,080
2016				116,908,141
2017				130,320,202
2018				143,732,263
2019				157,144,323

Graphics of forecasting broadband users in 2004-2014 is presented in Figure 5.

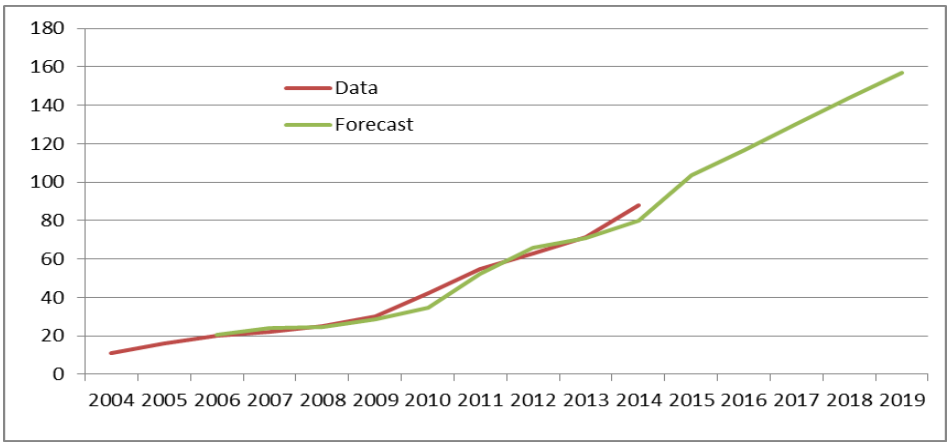

Figure 1. Forecasting Broadband Users

Based on the analysis performed using double exponential smoothing method, we can obtain the projected number of broadband users in 2015 up to 2019 which respectively are 103 496 080, 116 908 141, 130 320 202, 143 732 263, 157 144 323 as presented in Table 12.

5. Conlusions and Recomendations

5.1. Conclutions

Five factors that affect the use of broadband are population, gross domestic product, per capita income, economic growth and inflation, and the rate of penetration. The population of Indonesia from year to year is always increasing. This condition is a huge market share in increasing the use of broadband. Meanwhile, four other factors are economic sectors which would give an opportunity for the development of broadband with a condition that economic growth rate is very good, for example, if the public per capita income increases, then the opportunity to use broadband can also be achieved. Forecasting is performed to determine an estimate in the future in order to make planning decisions. Forecasting results show that for next five years, broadband users will always be increasing.

5.2. Suggestions

The greater Indonesia's population growing, higher gross domestic product, greater per capita income and under one digit inflation, despite bad economic growth rate, will provide added value for telecom operators to make a profit and be able to allocate rather great funds for broadband network investment.

Forecasting results showed that broadband users for the coming year will always be increasing. Thus, policy makers need to more quickly realize the target of broadband development plan year 2015 until year 2019, so that there will be wider community can access the Internet. This should be a concern for regulators, especially in re-arranging the frequency spectrum because with the increasing use of broadband a larger spectrum allocation is needed.

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