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Jurnal Manajemen Indonesia

Journal homepage: journals.telkomuniversity.ac.id/ijm

Regression Analysis of Inter-Variable Relationships within Business Canvas Model: Value Proposition, Key Resources, Revenue and Cost Structure With the Cobb Douglass Production Function Approach (Study Case: Basic and Chemical Industries From 2006-2017)

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Abstract

In the 21st century disruptive era, to survive, a company must innovate its business model constantly. In 2006 – 2017, the number of finish goods produced by base and chemical industry sector compares to agriculture and consumer goods sector were lower. Thus, this research tries to do the regression with the simultaneous approach by analysing variables combined from the business model canvas concept by Osterwalder and Pigneur, 2010, and production function Cobb Douglas. The BMC was filled with a financial report from Bloomberg. From the data, only several variables from BMC can be analysed; the variables are value proposition, key resources, revenue, and cost structure. This research also tries to analyse the relation between BMC internal variable with external variables from the macroeconomy. The research results are revenue positively influences finish goods, while revenue is positively influenced by the cost of good sols and external variable national GDP. ARIMA forecast is done in a static and dynamic model. From the static model founded that, from 2017-2018, BRNA and TPIA increase their finish goods significantly. For the longer prediction 2017 – 2025, a dynamic model is used, founded that all companies will not have significant growth in the production of their finished goods. The basic and chemical industry's finish goods are still going to be lower than the agriculture and consumer goods industry. They concluded that the manufacturing industry that relates directly to human's primary needs, the finish goods average, will always be higher than the basic industry and chemical in which this sector is not directly needed by humans.

Keywords: Business Model Canvas, Production Function Cobb Douglas, 2sls

Abstrak

Pada era disrupsi di abad 21, sebuah perusahaan dituntut untuk terus berinovasi terus dalam bisnis modelnya. Dalam kurun waktu 2006-2017, industri dasar dan kimia bila dibandingkan dengan industri pertanian dan *consumer goods* mengalami pertumbuhan jumlah produk yang siap dijual paling rendah. Oleh karena itu, penelitian ini mencoba menganalisa bisnis model dari industri dasar dan kimia dengan melakukan analisa regresi secara simultan yang menggabungkan konsep Business Model Canvas (BMC) Osterwalder dan Pigneur, 2010 dengan pendekatan fungsi produksi Cobb Douglas. BMC diisi dengan data laporan keuangan yang bersumber dari Bloomberg. Dengan keterbatasan data ini, maka variabel *value proposition, key resources, revenue, dan cost structure* yang akan dianalisa hubungannya. Penelitian ini juga mencoba menganalisa variabel eksternal ekonomi makro terhadap BMC. Didapatkan hasil penelitian variabel *revenue* mempengaruhi *finish goods* secara positif dan *revenue* dipengaruhi secara positif oleh variabel *cost of goods sold* dan variabel eksternal BMC Produk Domestik Bruto. Prediksi ARIMA juga dilakukan baik secara *static* maupun *dynamic*. Prediksi dengan model *static* didapatkan hasil bahwa dalam periode 2017-2018 dua perusahaan BRNA dan TPIA mengalami pertumbuhan *finish goods* yang signifikan. Bila dilakukan prediksi model *dynamic* dengan rentan waktu yang lebih panjang 2017 – 2025 didapatkan hasil semua perusahaan tidak akan mengalami perubahan jumlah *finish goods* yang signifikan jadi jumlah produk dari industri dasar dan kimia tetap lebih rendah dibandingkan dengan industri pertanian dan *consumer goods*. Disimpulkan bahwa industri manufaktur di Indonesia yang terkait langsung dengan kebutuhan primer manusia yakni pangan, rata – rata jumlah *finish goods* akan lebih tinggi dari industri dasar dan kimia yang tidak dibutuhkan manusia secara langsung.

Kata kunci: *Business Model Canvas*, Fungsi Produksi Cobb Douglas; 2sls

I.   INTRODUCTION

The terminology business model was first published in Bellman's scientific article, Clark et al., in 1957. The business model is a description of how value is generated by a company (Osterwalder and Pigneur, 2010). Since the website was launched in the 1990s, this term has become increasingly popular in the business world. (Zott, Amit, and Massa, 2011). The factors driving the emergence of business models are that fast-paced change is taking place today, and business competition is increasingly competitive, making business decisions increasingly more complex and difficult. The company is required to analyze data and to make quick decisions on the basis of new information from the advancement of information technology every day, the product life cycle is shorter and must face competition in a competitive global market (Osterwalder, 2004). It is therefore important to discuss the business model, because by knowing the business model, the company can make strategic decisions. In addition, the concept of a business model has also emerged motivated by many new forms of business, such as online and virtual based business (ALT & Zimmermann, 2014; Wirtz, Pistoia, Ullrich, & Göttel, 2015). Further to the publications Chesbrough and Rosenbloom (2012) and Magretta (2002), business models have begun to be linked to the company's strategy and innovation. Since then, many studies have been discussing the business model.

On the other hand, some developed countries, such as Japan and the United Kingdom, have pioneered the first industrial revolution in Asia and Europe, are currently unable to compete in manufacturing costs with developing countries, and this has an impact on state GDP (Konno, 2018). One of the strategies pursued by developed countries is to develop a business model on an ongoing basis, as the business model can help the company develop the market and profit (Senoh, 2010). In the era of disruption, the business model needs to be renewed with continuous innovations (Osterwalder, 2010).

The basic and chemical industries are one of the manufacturing subsectors of the Indonesian Stock Exchange. Figure 1 shows that in the period 2006-2017, compared to the increase in the number of finished goods with consumer goods and agriculture, basic industry and the chemical industry was the lowest.
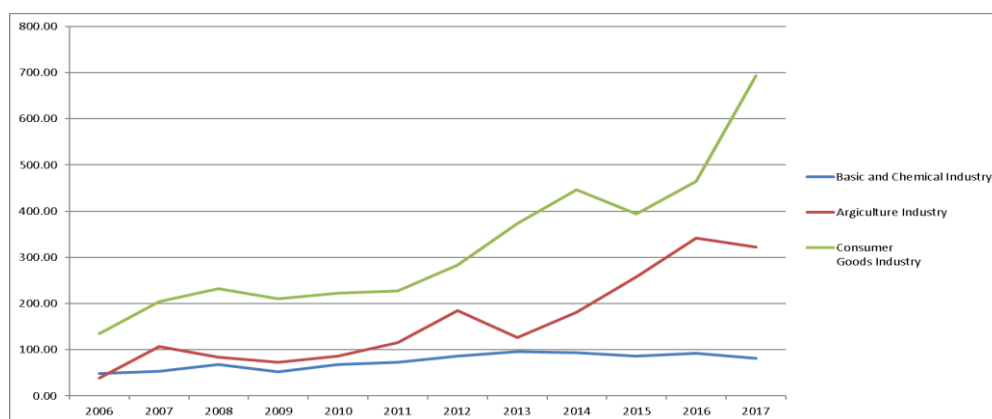

Figure 1. Finish Goods Development in Basic and Chemicals Industry, Agriculture Industry, and Consumer Goods (Source: Bloomberg, 2017 data processed)

Within the context of the decreasing the number of finished goods from the basic industry and chemistry, it is necessary to carry out research, with regression analysis, variables that affect the growth of finished goods from the basic and chemical industries can be identified. The business model canvas approach is needed to map the relationship between the variable value proposition, the key resources, the cost structure, and the revenue stream of the basic and chemical industries in the years 2007-2017. What variables have a significant impact on the finished goods and the percentage?

Business Model Canvas (BMC) is a tool for describing, analysing, and designing the business model (Osterwalder and Pigneur, 2010). BMC can visualize the solutions, infrastructure, customer and financial condition of the company, the aim of BMC is to make strategic management decisions (Barquet, Ana Paula B., et al., 2011). The term business model is paired with the word canvas, because by filling our BMC like painting on canvas, and the results can make it easier for people to understand the logic of how a business is going, such as painting on canvas that can be enjoyed and understood by everyone. In Osterwalder's BMC there are nine

variables that make up BMC: value proposition, customer segment, channel, consumer relationship, key resources, key activities, key partners, cost structure and revenue stream. Four of the nine variables to be analysed for the relationship are selected: value proposition, key resources, cost structure and revenue stream. This limitation variable is done over several things:

1. For research to be more focused
2. Research data is a secondary data sourced from Bloomberg's annual financial report, the four variables that can be obtained and that are relevant to the BMC context. Other variables require primary data, that must be verified directly:

The BMC regression analysis was conducted in this research. Regression analysis is carried out using an econometric approach to obtain research results that can be scientifically proven. According to Teeboom (2019), the data is the core of the regression analysis and the five benefits of the regression analysis are:

1. Forecast analysis of future opportunities and risks. For example, predict future sales, know what variables affect sales, e.g. ads, and then companies can predict which sales will happen.
2. Operational effectiveness. By conducting a regression analysis, operating variables can be identified so that insignificant variables can be reduced, and businesses can run efficiently.
3. Support decision-making. The regression analysis of strategic decisions can make the company more accurate and scientifically tested because it is based on historical data.
4. New information, please. By looking at the relationship between variables that affect the course of the company, the leader of the company can make future planning a success.

Variables in the BMC are interconnected variables in the output input context. The Cobb Douglas production function is commonly used to describe the input output relationship in the context of econometrics. Therefore, both are brought closer to the research to be empirically proven.

The research objectives are as follows:

1. Develop BMC from the basic and chemical industries with secondary data from the company's annual financial statements.
2. Connecting BMC to the Cobb Douglass production function.
3. Analyzing the causal relationship between variable value proposition, revenue, key resources and cost structure of the BMC industry base and chemistry with the Cobb Douglas production function.
4. Predict the growth of the basic and chemical industries (lowest finished goods) over the next five years.
5. Provide strategic recommendations for the development of the BMC industry base and chemistry 6. Provide strategic recommendations for young entrepreneurs who want to start a natural and synthetic grassroots industry business.

This research is intended to test BMC with a quantitative approach, which has not been done before, since the BMC is generally examined in qualitative. With strong data, this research is expected to confirm the BMC concept.

II. Literature Review

A. Business Model

Some definitions of business models:

The representation of content, structure, transactional leadership that is designed in such a way through the search for business opportunities (Amit & Zott, 2001). ·

- Narration on how a company operates (Margretta, 2002 cited in Qastharin, 2015). ·
- Architecture, design, pattern, planning, methods, assumptions, and business statement (Morris, Schindehutte, & Allen, 2003). ·
- Description of the variables that the company needs to run its business (Osterwalder, 2004) ·
- Representation of the core logic of the company (Shafer et. AL, 2005) ·
- Rational representation of how the company creates, sends, and captures value (Osterwalder and Pigneur, 2010)

B. BMC Osterwalder

The business Model Canvas, commonly used by the company, is a BMC developed by Osterwalder in 2010 in his book "Business Model Generation."

Fig. 2. Four main pillars of BMC (Source: Strategyzer, 2008)

Figure 2. shows that the four main pillars of the BMC are:
What = Value of Proposition = Products or services offered by the company
Who = Customer interface = Customer segment and what type of relationship and how to reach the customer?
How = Infrastructure Management How = Financial Aspect
In terms of level BMC can be divided into two levels operation and commitment.

Of these four pillars, BMC is divided into nine variables that explain the core of how a company can run its business. Broadly divided BMC, five variables focus on the customer, and the other four variables are the variables that the company needs to be able to make the other five variations. The preparation of BMC starts from right to left, starting with who the target customer, product or service offered, how and what it takes to produce such products and services.

Five variables focusing on the customer

1. Customer Segment: Customer segments requiring a value proposition are offered. Customers may be divided into segments according to the similarity of social strata or behavior. Example of the customer segment is the mass market (business model for the needs of all people, e.g. consumer electronics, food), niche market (business that caters to specific customer segments, and in general volume is not large), diversified market (business with two different customer segments needs and problems).
2. Value Proposition: A solution offered by the company to answer customer's problems and needs. Offered can be products or services that specifically answer the needs of certain segment. According to Osterwalder (2010) Several viewpoints to create value proposition:
   - Novelty in answering customer needs.
   - Better performance than the available product in the market
   - Personalized to customer needs, co-creation concept is very important here.
   - Good design look.
   - Show status, customer can proudly use the product.
   - Competitive price.
   - Reduce the cost and risk of buyers by offering extra service.
   - Opening access for customers to receive products or services that have never been obtained before.
   - Provide comfort and convenience for customer.
3. Channel: Communication platform used by the company to reach the customer segment, as well as distribution and sales platforms to provide value proposition to the customer.

4. Customer Relationship: a description of how the company develops and maintains relationships with its customer segments.
5. Revenue: Company revenue from the sale of value proposition to all segments of the customer.

Four variables to run a business

1. Key Partners: All the partners and suppliers needed to produce the value proposition offered. According to Osterwalder (2010) key partners are divided into four: strategic alliances with non-competitors, a strategic alliance with Competitor, joint venture to open new business, buyer-supplier relationship to ensure business continuity.
2. Key activities: All activities that need to be done to provide value proposition to customer, build relationship with customer segment, build channel, and activity to increase company income. Ideally, the company focuses on key activities that really become the uniqueness of the company, other activities can be done by the partner.
3. Key Resources: Resources, assets, capital needed to generate a value proposition, build relationships with customers, channels, and income.
4. Cost Structure: All the costs required eight business model variables to be able to run.

BMC Function (Osterwalder, 2004):

1. Helping the company make a decision, mapping nine BMC variables that explain the course of the business process in one large chart, the management of the company can make a wise decision.
2. In order to help strategic planning, with BMC mapping all business processes in one another, the management of the company can gain a new perspective on strategic planning.
3. Increase the company's innovation. In the process of filling the company's leadership, BMC must conduct a fairly deep internalization and contemplation process, which can, in itself, help the company to innovate continuously.
4. Improve the communication process and transparency of the company. With the BMC chart, all the parties in the company can understand the business processes of the company. For example, if there is an increase in one of the BMC variables, this needs to be done between divisions to allow other variables to run.

The BMC developed by Osterwalder is licensed as a Creative Commons Attribution share, which means that anyone can modify the BMC Osterwalder according to their respective needs.

C. Cobb Douglas Production Function

Nine variables in BMC are fundamentally like production functions, i.e. physical connections between production (input) and output (output), through the form of equations involving dependent and independent variables. Output is the result of production, and the inputs are capital, raw materials, labour, and technology. Capital is the money or asset used by the company for economic purposes (The Economist, 2019). There are four types of capital, according to Hargrave (2019) in Investopedia.com:

1. Debt Capital
   Capital gained from debt through private sources such as banks, insurance companies, family, and friends.
2. Equity Capital
   Capital gained from investors in return for the shares of the company.
3. Working Capital
   Capital owned by the company from the difference company-owned assets such as cash, basic material inventory and finished products with company liquidity. Working capital can therefore be used to measure the financial health of the company.
4. Trading Capital
   Capital derived from the purchase of securities, is generally referred to as the bank roll.

Production function:

$$Q = F(C,L,R,T) \tag{1}$$

Q (quantity) = The number of products and services produced (output) (output)
f (function)
C (capital) = The value of all machinery, facilities and buildings
L (labor) = Total number of people work-hours per year
R (resources) = Material used to manufacture goods and services that meet human needs.
T (technology)
(C, R, L, T) = Production factors as input

The equation of this function was introduced in 1920 by Charles W. Cobb and Paul H. Douglas. To be analysed with the Cobb Douglas production function, the equation needs to be made in logarithmic equations to make it linear (Soekartawi, 2003).

$$\mathrm{Log} Y = \mathrm{Log}\, a + \beta_1 \mathrm{LogX1} + \beta_2 \mathrm{LogX2} + \beta_3 \mathrm{LogX3} + \beta_4 \mathrm{LogX4} + \beta_5 \mathrm{LogX5} + e \qquad (2)$$

Requirements for the use of the Cobb Douglas function There are no data that is zero because the logarithm cannot be read at 0, as well as the value must be read in the anti-log (Soekartawi, 2003).

Output Elasticity

Regression analysis of the production function will generate a regression coefficient, which will also show the magnitude of the output elasticity, which is the percentage of the output change due to the input material. In the production function of Cobb Douglas, the elasticity of the production is determined by the coefficient of each independent variable (Joesron and Fathozazi, 2012 cited in Rosari, 2013).

According to Nicholson (1994) Input elasticity of production has two properties:

1. If e is < 1, it is inelastic
2. If e > 1, it is elastic

If the input is increased by 1%, the output of the elasticity will increase if the other variables are the same.

Result Scale

The scale of the result or return to the scale is the scale of the output change generated by the addition of the input amount. According to Arsyad, in Rosari (2013) there are three possible returns of scales:

1. Increased scale results 5-007 + β > 1, i.e. the proportion of added input will give bigger result than the input amount.
2. Constant scale result 5-007 + β = 1, which means that the added proportion of the input will give the same result in an additional output.
3. Decreased scale result $\alpha + \beta$ < 1 means that the proportion of the added input will give smaller result than the input amount. Input will produce an additional output that is smaller in proportion to the addition of the input

According to Nicholson (1994) cited in Rosari (2013) the scale of the results is needed to see the reaction of adding inputs to the output. The result scale can be obtained from the sum of the coefficient value.

D. Previous research

Research entitled "Quantitative Analysis of Business Models and Manufacturing Approach to Business" conducted by Tsutomu Konno (2018). BMC manufacturing companies in Japan with a quantitative approach to primary data to analyse factors that change the business model of the company. Researchers identify the old and new BMC of a company based on changes in the year and give ordinal scale 1-5 for the changes happen in each BMC Variables. Research recommended that the old BMC variable value proposition, customer relationship, key resources and cost structure are positively correlated.

Table 1. Tsutomu Konno BMC's Research

Variables	BMC Changing Variables in BMC	BMC Constant Variables
Key Activities	Activities shifted to service and production decreased	It is important to carry out R&D, manufacturing, sales, maintenance of fixed assets.

Value Proposition	Although product supply is declining, the product is still being sold cheaply.	Quality, comfort, function, and effectiveness are the features and products and services uniqueness that need to be maintained.
Customer Relationship	Customer is not one-time business relationship but a connection with customer that need to be built continuously.	Relationship with the customer shall be maintained with the rental concept.

Vinta Rosari (2013)

Research titled "Analysis of the Cobb Douglas Sugar Mill Production Function Case Studies at PT. Madubaru di Bantuk." The research formula is log Y = 5-007 log labor + log engine + log cane. The result is that the most significant variable affecting output is the raw material of the sugar cane and the machine with a probability value of $< 0,05$. The return to a scale value of < 1 which means that the company has a declining condition, as the addition of inputs is not followed by the addition of significant outputs.

E. literature review analysis

Several things can be concluded based on the above literature study:

1. In the Cobb Douglas production function, the associated variable was obvious and previous research using the output model = capital + labor + raw material + technology
2. In the BMC variable, value proposition operational level = key resources + key activities + key partners + cost structure. Value proposition on customer level = Customer segment + Customer relationship + Channel + revenue.
3. Based on BMC and Cobb Douglas Production Function, the first research model was developed, and the variables analyzed were adapted to the data availability from the company's annual financial statements.
   Value proposition = key resources (capital + labor + raw materials + technology) + cost structure + revenue.
   The research novelty is the addition of cost structure and revenue from BMC variables to the Cobb Douglas production function.
4. The second model is designed to see whether the external factor of the economic macro affects the variables in the BMC. Revenue = rate of unemployment + GDP + inflation

III. RESEARCH METHOD

The research uses the secondary data panel, which combines time series with the period 2007-2017 and cross-section 10 basic and chemical industries, which have been going public for 13-19 years. The data used is derived from Bloomberg's annual financial report.

Table 2. List of Companies

Companies	Sub Sector
PT. Indah Kiat Pulp and Paper (INKP)	Paper
PT. Pabrik Kertas Tjiwi Kimia (TKIM)	Paper
PT. Kedaung Setia Industrial (KDSI)	Enamel Pan
PT. Indal Aluminium Industry (INAI)	Aluminium
PT. Intanwijaya Internasional (INCI)	Diamond
PT. Asiaplast Industry (APLI)	Plastic
PT. Berlina (BRNA)	Plastic
PT. Alumindo Light Metal Industry (ALMI)	Aluminium
PT. Polychem Indonesia (ADMG)	Plastic
PT. Chandra Asri Petrochemical Tbk (TPIA)	Plastic

Nine variables in the basic and chemical industry BMC are filled with data from the company's financial annual report.

Table 3. Business Model Canvas Variable translated into input and output variables

| OUTPUT					INPUT			
Value proposition	Customer Segment	Customer Relationship	Channel	Revenue	Key Activities	Key Resources	Key Partner	Cost Structure
Solutions offered by the company	Buyers' market segment	Build relation with customer	Platform to reach customer	Company 'sources of income	Process needed to produce value proposition	Company's assets	Stakeholder needed to produce value proposition	Cost to create and deliver value proposition to customer
Finish Goods (number of ready goods to be sold)	-	-		Basic and Chemical Industries have two type of revenues: Revenue from import and export	-	Total capital (long term debt and shareholder equity)	-	Sales/Marketing/ Advertising Expenses – SMAE
						Employee *(number of workers)*		Cost of goods sold
						Property Plant & Equip (Tangible Fixed Assets*)*		Personal Expenses per Employee
						Raw material		General and Administrative Expenses
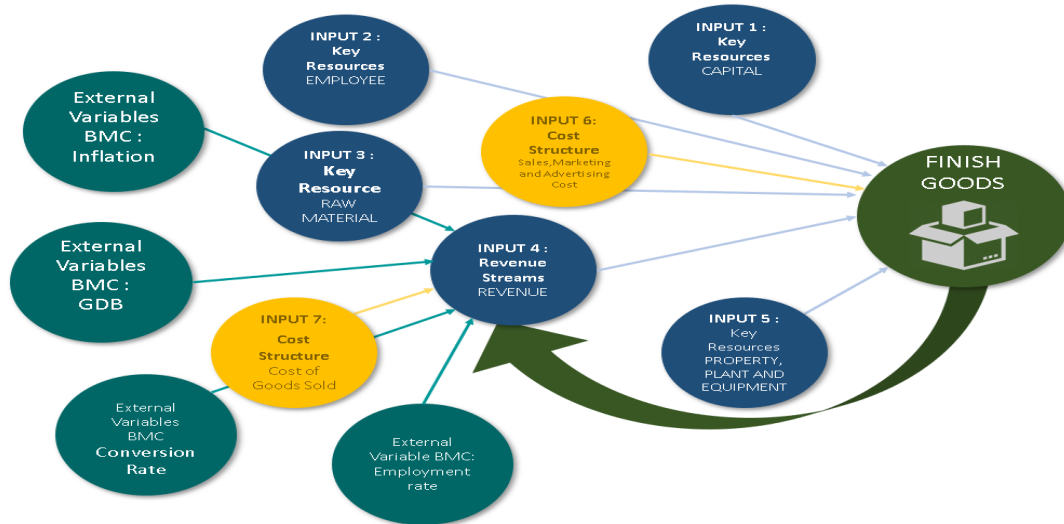
Figure 3. Research Model Framework

Analysis in research used simultaneous equation models because the variables examined are interconnected. Simultaneous models of equations are formulated as follows:

Formula 1: $FG_{it} = \alpha + Log\beta_1 CAPITAL_t + Log\ \beta_2 EMPLOYEE_t + Log\ \beta_3 RAWMATERIAL_t + Log\ \beta_4 RV_t + Log\ \beta_5\ SMAE_t + Log\ \beta_6\ PROPERTY_{t\ +}\ \beta_7 DUMMYE_t$

where : FG = *finish goods* = amount of ready goods to be sold
EMPLOYEE = numbers of employee
RAWMATERIAL = amount of raw material
RV = revenue
SMAE = sales, marketing, and advertising expenses
PROPERTY = company's asset
DUMMYE = companies who do export = 1, not exporting = 0
α = Constanta
β = Variable Coefficient
e_{it} = error component during certain period for a unit of cross section

The second formula is compiled on the basis that in the business of the required model assumptions the outer factors of BCM (Osterwalder, 2010) i.e. the macroeconomic variables. It is therefore incorporated macroeconomic data as the exchange rate, GDP, and unemployment rate of Indonesia

Formula 2: $RV_{it} = \alpha + Log\beta_1 FG_t + Log\ \beta_2 CGS + Log\ \beta_3 GDB_t + Log\ \beta_4 KURS_t + Log\ \beta_5 GDP_t + Log\ \beta_6 INFLATION_t$

where: Internal BMC Factors
FG = *finish goods* = amount of ready goods to be sold
CGS = *Cost of Goods Sold*
External BMC Factors:
GDB = Gross Domestic Bruto
KURS = Exchange rate USD IDR
UNEMPLOYMENT RATE= Indonesia unemployment rate
INFLATION = Inflation
α = Constanta
β = Variable Coefficient
e_{it} = error component during certain period for a unit of cross section

Endogen variable FG dan RV (2)
Exogen variable (11)

Formula 1: K-k = 13-6 = 7 > M-1 = 2-1 > overidentified
Formula 2: K-k = 13-4= 9 > M-1 = 2- 1 > overidentified

So, the method used is 2sls

Research Hypotheses are:

Formula 1:
- Ho = Capital variable does not influence finish goods
- H1 = Capital variable positively influence finish goods
- H2 = Employee variable does not influence finish goods
- H3 = Employee variable positively influence finish goods
- H4 = Raw material variable does not influence finish goods
- H5 = Raw material variable positively influence finish goods
- H6 = Revenue variable does not influence finish goods
- H7 = Revenue variable positively influence finish goods
- H8 = Sales, marketing and advertising expenses variable does not influence finish goods
- H9 = Sales, marketing and advertising expenses variable positively influence finish goods
- H10 = Property variable does not influence finish goods
- H11 = Property variable negatively influence finish goods
- H12 = Dummy variable export/non export does not influence finish goods
- H13 = Dummy variable export/non export positively influence finish goods

Formula 2
- H14 = Finish goods variable does not influence revenue
- H15= Finish goods variable positively influence revenue
- H16= Employee expenses variable does not influence revenue
- H17= Employee expenses variable positively influence revenue
- H18 = *Cost of goods sold* variable does not influence revenue
- H19 = *Cost of goods sold* variable positively influence revenue
- H20 = GDB variable does not influence revenue
- H21= GDB variable positively influence revenue
- H22 = KURS variable does not influence revenue
- H23 = KURS variable negatively influence revenue
- H24= GDP variable does not influence revenue
- H25= GDP variable negatively influence revenue
- H26= Inflation variable does not influence revenue
- H27= Inflation variable negatively influence revenue

IV. RESULT AND DISCUSSION

A. Descriptive statistic

Table 4. Descriptive Statistic

Companies	Mean	SD	BJ Prob
ADMG	31.43	6.09	0.50
ALMI	5.97	4.43	0.08
APLI	6.98	4.81	0.09
BRNA	9.77	4.71	0.62
INAI	16.07	9.90	0.29

INCI	3.16	2.16	0.11
INKP	77.73	25.33	0.89
KDSI	24.15	4.80	0.77
TKIM	3.83	1.30	0.67
TPIA	17.25	11.06	0.20

Based on the descriptive analysis from one of the endogenous variables finished goods, the mean and the standard deviation values are different, it can be said that each company has different characteristics.

B. Unit Root Test

Root test units are carried out on all research operational variables

$$FG_{it} = \alpha + Log\beta_1 CAPITAL_t + Log\ \beta_2 EMPLOYEE_t + Log\ \beta_3 RAWMATERIAL_t + Log\ \beta_4 RV_t + Log\ \beta_5\ SMAE_t + Log\ \beta_6\ PROPERTY_{t\ +}\ \beta_7 DUMMYE_t$$

Table 5. Unit Root Test Formula 1

Operational Variable Formula 1	Level	ADF	Keterangan
CAPITAL	1	0.0128	Data stasioner
EMPLOYEE	2	0.0008	Data stasioner
RAWMATERIAL	1	0.0000	Data stasioner
RV	1	0.0000	Data stasioner
SMAE	1	0.0000	Data stasioner
PROPERTY	1	0.0000	Data stasioner

$$RV_{it} = \alpha + Log\beta_1 FG_t + Log\ \beta_2 CGS + Log\ \beta_3 GDB_t + Log\ \beta_4 KURS_t + Log\ \beta_5 GDP_t + Log\ \beta_6 INFLATION_t$$

Table 6. Unit Root Test Formula 2

Operational Variable Formula 2	Level	ADF	Keterangan
FG	1	0.0000	Data stasioner
CGS	1	0.0000	Data stasioner
GDB	0	0.0116	Data stasioner
KURS	1	0.0003	Data stasioner
GDP	1	0.0000	Data stasioner
INFLATION	0	0.0000	Data stasioner

C. Hausman TEST

The regression test model for panel data with EViews has three types: a common effect model, a fixed effect model and a random effect model. From Hausman Test found that the data is random because the probability value is 1, bigger than 0.05.

Table 7. Estimation result with random effect

Variabel	Coefficient	t-Statistic	Prob.
C	-1.607024	-6.642031	0.0000
CAPITAL	-0.220328	-2.150256	0.0337
EMPLOYEE	0.388084	5.302972	0.0000
RAWMATERIAL	0.138163	1.556500	0.1224
RV	0.596379	3.874975	0.0002
SMAE	-0.216832	-2.522091	0.0131
PROPERTY	0.306458	3.863403	0.0002
DUMMYE	0.055042	0.985923	0.3263
R-squared	0.745998		
Prob(F-statistic)	0.000000		
Durbin-Watson stat	0.000000		
Where $\alpha = 5\%$			

Based on the estimate result, it can be known that variable capital, employees, revenues, sales, marketing and advertising costs and property are significantly affecting finish goods as all of them have probability lower thank < 0.05. These variables can describe finish goods for 74,5998%, so there are 25,4002 % of other variables affect finished goods that cannot be explained by this model. Employee, income, and property have a positive effect on final goods and capital and marketing and advertising costs have negative impact on finish goods. Several things can be known from the coefficient value:

- If employee increase by 1%, it will increase final goods by 0.388084%
- If revenue increase by 1%, it will increase final goods by 0.596379%
- If property, plant, and equipment increase by 1%, it will increase final goods by 0.306458 %
- If capital increase by 1%, it will reduce the final goods by 0.220328%
- If sales, marketing, and advertising cost increase by 1%, It will reduce final goods by 0.216832%.
- The elasticity value of all the significant variables is < 1 which means inelastic. Therefore, finished goods is less sensitive to changes in employees, income, property and equipment, capital and sales, marketing, and advertising costs.

Other variables are raw material and dummy export and non-export variables do not affect finish goods.

From the estimated results of the equation:

$$FG_{it} = -1.607024 - 0.220328\ CAPITAL_t + 0.388084\ EMPLOYEE_t + 0.138163\ RAWMATERIAL_t + 0.596379\ RV_t - 0.216832\ SMAE_t + 0.306458\ PROPERTY_t + 0.055042\ DUMMYE_t$$

Regression Analysis formula 2

It is known with Hausman test the probability value is 0.9730, bigger than 0.05. Then the data must be analysed randomly. The estimation result with random data model.

Table 8. Regression Result Formula 2

Variabel	Coefficient	t-Statistic	Prob.
C	-3.448721	-1.875895	0.0633
FG	0.512957	4.937935	0.0000
CGS	0.388782	3.780922	0.0003

GDB	0.361621	2.990622	0.0034
KURS	0.667905	1.771497	0.0792
GDP	0.722060	2.175667	0.0317
INFLATION	-0.048868	-0.631418	0.5290
R-squared	0.601526		
Prob(F-statistic)	0.00000		
Durbin-Watson stat	0.601526		
where α = 5%			

From this data, it can be noted that the final goods, the cost of good sales, the gross domestic product and unemployment have a significant impact on revenue because they have probability below 0.05. These variables can describe revenue by 60.1526 %, so there are 34.8474% other variables affect revenues that cannot be explained by this model. All variables have a positive effect on revenue. Several things can be known from the coefficient value:

- If finish goods increase by 1%, it will increase revenue by 0.512957%
- If cost of goods sold increases by 1%, it will increase revenue by 0.388782%
- If GDP increases by 1%, it will increase revenue by 0.361621%.
- If unemployment increases by 1%, it will increase revenue by 0.722060%.
- The elasticity of all the significant variables is below 1 which means inelastic, the conditions in which the change in revenue is less sensitive to the change of finish goods, cost of goods sold, GDP and the suspension.

From the estimated results of the equation:

RV_{it} = -3.448721+ 0.5122957 FG_t + 0.388782 CGS + 0.361621 GDB_t + 0.667905 $KURS_t$ + 0.722060 GDP_t – 0.048868 $INFLATION_t$

To obtain BLUE (Best Linear Unbiased Estimate) result from regression analysis, the model need to pass the classical assumption test, that is, the test normality to know whether or not the distributed data is normal, multi-collinearity tests to determine the presence / absence of linear linkages between independent variables, and the heteroskedasticity test to determine if the error is heterogeneous or homogeneous.

D. Normality Test

Table 9. Normality Test

Hausman Test	BJ Prob.	Analysis
Formula 1	0.000001	Abnormal data distribution
Formula 2	0.000000	Abnormal data distribution

From Jarque-Bera Probability <0.05, so data is not distributed normally

E. Multicolinearity test

Based on the results of the correlation test, several explanatory variables have a strong correlation because of their value are bigger than 0.7.

Formula 1:

Table 10. Multicollinearity Test Result Formula 1

	CAPITAL	EMPLOYEE	RAWMATERIAL	RV	SMAE	PROPERTY	DUMMYE
CAPITAL	1.00	0.81	0.70	0.70	0.80	0.72	0.19
EMPLOYEE	0.81	1.00	0.74	0.74	0.65	0.61	0.38

RAWMATERIAL	0.70	0.74	1.00	0.81	0.76	0.63	0.22
RV	0.70	0.74	0.81	1.00	0.74	0.76	0.19
SMAE	0.80	0.65	0.76	0.74	1.00	0.71	0.15
PROPERTY	0.72	0.61	0.63	0.76	0.71	1.00	-0.09
DUMMYE	0.19	0.38	0.22	0.19	0.15	-0.09	1.00

Independent variables that have correlations:

- Capital and employee (0.81)
- Capital and SMAE (0.8)
- Employee and raw material (0.74)
- Employee and revenue (0.74)
- Raw material and capital (0.7)
- Raw material and employee (0.74)
- Raw material and revenue (0.81)
- Raw material and SMAE (0.76)
- Property and capital (0.72)
- Property and revenue (0.71)

Formula 2

Table 11. Multicollinearity Test Result Formula 2

	FG	**CGS**	**GDB**	**KURS**	**GDP**	**INFLATION**
FG	1.00	0.53	0.20	0.19	-0.21	-0.08
CGS	0.53	1.00	0.21	0.19	-0.19	-0.05
GDP	0.20	0.21	1.00	0.59	-0.71	-0.33
KURS	0.19	0.19	0.59	1.00	-0.88	-0.13
GDP	-0.21	-0.19	-0.71	-0.88	1.00	0.39
INFLATION	-0.08	-0.05	-0.33	-0.13	0.39	1.00

Independent variables that have correlations:
- Kurs and GDP (0.88)
- GDP and GDB (0.71)

After knowing which variables have a multi correlation issue, some of the variables with correlation value above 0.7 are discarded and generated the estimate random data model as follows:

Table 12. Hausman Test Result

Hausman Test	**Prob.**	**Analysis**
Formula 1	1.0000	Random data
Formula 2	0.9457	Random data

Table 13. Formula 1

Variable	**Coefficient**	**t-Statistic**	**Prob.**
C	-1.276311	-4.192307	0.0001
CAPITAL	0.173492	1.052770	0.2947
PROPERTY	0.107033	0.716469	0.4752
RV	0.683614	3.542512	0.0006

DUMMYE	0.048079	0.656949	0.5125
R-squared			
Prob(F-statistic)	0.428695		
Durbin-Watson stat			
	1.260913		
where α = 5%			

Revenue is still a significant variable with probability value below 0.05, and this variable can explain finish goods by 42.8695%, so there are still 57.1305 % other variables are not explained in the model. The revenue variable has a positive effect on the finished goods, so if revenue increases by 1%, it will increase finished goods by 0.683614%. The significant variable is still inelastic towards the finished goods. The scale value of 0.1734 + 0.1070 + 0.6836 + 0.048 = 1.012. the output scale value for 2016-2017 > 1 means that the change in input, it will give in a major change in input.

Table 14. Formula 2

Variabel	Coefficient	t-Statistic	Prob.
C	-0.481373	-0.567053	0.5718
FG	0.157487	0.612622	0.5413
CGS	0.671812	3.186027	0.0019
GDP	0.301430	2.841292	0.0053
KURS	0.068880	0.349867	0.7271
INFLATION	0.009646	0.151256	0.8800
R-squared	0.646675		
Prob(F-statistic)	0.00000		
Durbin-Watson stat	0.661716		
where α = 5%			

The still significant variables are cost of goods sold and GDP with probability value below 0.05. The variables can explain revenue by 64.6675%, so there are still 35.3325% other variables are not yet explained in the model. Variable cost of goods sold, and GDP has a positive effect on revenue. If cost of goods increases by 1%, it will increase revenue by 0.671812% if GDP increase by 1%, it will increase revenue by 0.301430 %. Significant variables are still inelastic towards revenue.

F. Estimation Result Analysis

Based on simultaneous test, the relationship between significant variables in the industrial BMC basic and chemical sectors are depicted on BMC as follows:
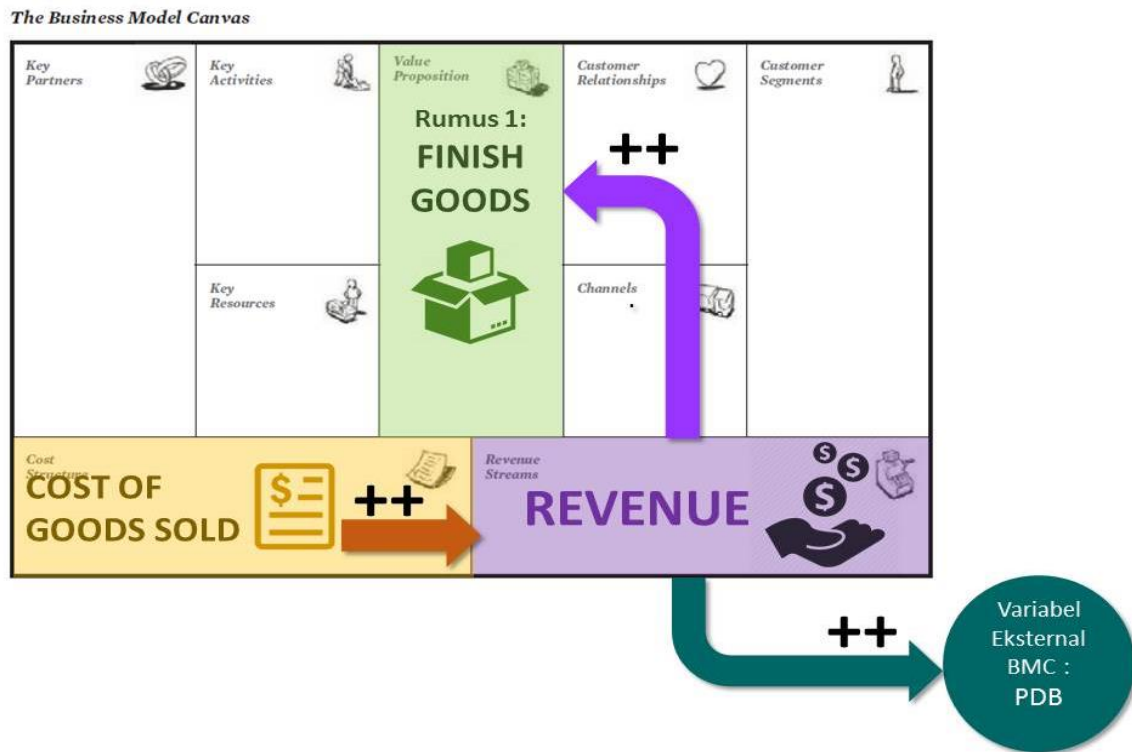
Figure 4. Estimation result analysis on BMC

The relationship between Revenue and Finish Goods

From the first formula it is founded that revenue is a significant variable for finish goods.

Table 15. Revenue Variable

Year	Revenue	Finished Goods	Analysis
2006	2.69	1.28	RV up FG down
2007	2.76	1.26	RV up FG down
2008	2.83	1.26	RV up FG stable
2009	2.74	1.27	RV down FG up
2010	2.80	1.33	RV up FG up
2011	2.90	1.43	RV up FG up
2012	2.92	1.47	RV up FG up
2013	2.94	1.53	RV up FG up
2014	2.99	1.56	RV up FG up
2015	2.97	1.54	RV down FG down
2016	2.99	1.62	RV down FG down
2017	3.04	1.55	RV up FG down

Can be seen in the table above for a period of 12 years, from the year 2009-2016 (7 years) variable revenue and finished goods move in the same ascending or descending direction. It can be concluded that both variables have an impact on each other. As a result, an increase in revenue will increase the number of products ready to be sold by companies (finish goods) and vice versa. Thus, the new BMC variables added in this study significantly influenced the output of the Cobb Douglas production function.

The Relationship Between Revenue, Cost Of Goods Sold, Dan GDP

Table 16. Variable Relationship Analysis

	REVENUE	**CGS**	**GDP**	**ANALYSIS**
2006	2.69	2.65	2.56	
2007	2.76	2.70	2.64	RV, CGS, GDB up
2008	2.83	2.78	2.71	RV, CGS, GDB up
2009	2.74	2.67	2.73	RV, CGS down GDB up
2010	2.80	2.73	2.88	RV, CGS, GDB up
2011	2.90	2.84	2.95	RV, CGS, GDB up
2012	2.92	2.87	2.96	RV, CGS, GDB up
2013	2.94	2.88	2.96	RV, CGS up GDB stable
2014	2.99	2.93	2.95	RV, CGS, GDB up
2015	2.97	2.91	2.94	RV, CGS, GDB down
2016	2.99	2.92	2.97	RV, CGS, GDB up
2017	3.04	2.97	3.01	RV, CGS, GDB up

It can be seen in the table above in the period of 12 years, 8 years Revenue variables, Cost of Goods Sold and GDP moving together equally up or down. It can be concluded that these three variables have an impact on each other. As a result, GDP will increase revenues and the cost of goods sold.

G. Hypotheses tested

The proven hypotheses:

- Ho = Capital variable does not influence finish goods
- H7 = Revenue variable positively influence finish goods
- H10 = Property variable does not influence finish goods
- H13 = Dummy variable export/non export positively influence finish goods
- H14 = Finish goods variable does not influence revenue
- H19 = Cost of goods sold variable positively influence revenue
- H21= GDB variable positively influence revenue
- H22 = KURS variable does not influence revenue
- H24= GDP variable does not influence revenue
- H26 = Inflation variable negatively influence revenue

V. CONCLUSION

Several things can be concluded based on the results of the analysis and discussion from the previous chapter:

1. After the test correlation, all the variables that have problems with multi-collinearity have been removed, then the variables in the BMC that simultaneously significantly influence finished goods are the revenue and the cost of the goods sold.
2. The macro-economic variables outside the BMC have a significant impact on revenue is GDP.
3. Revenue, the cost of goods sold, and GDP is inelastic, which means change on revenue is less sensitive to the change in finished goods, the cost of goods sold and GDP.
4. The result scale for all the basic industry from 2006-2017 is higher than 1, which means that the change in input will result in a significant change in output.
5. Back to the purpose of BMC is a description of how a company creates value and operates its business process. In the context of the basic and chemical industries, the ability of the company to generate

revenue and manage the cost of goods. These variables describe the business process of the basic and chemical industries. In macro economy level the change in GDP, it will affect the basic and chemical industries revenues and cost of goods sold.

6. Research limitation may occur due to data limitations from the financial statements, some important variables in the BMC that may affect the final goods of companies, such as the variable cost structure: research & development. Other BMC variables such as customer segment data, channel data and customer relationship must be verified directly, cannot be based on secondary data. This research cannot do full analysis the relationship between all variables in the BMC. The relationship between variable value proposition, key resources, cost structure and revenue are successfully investigated.

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