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INSTITUT LATIHAN STATISTIK MALAYSIA (ILSM), SUNGKAI, PERAK

CONTRIBUTION OF SELECTED MSICs IN MANUFACTURING SECTOR TO CONSTRUCTION GDP

by

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OUTLINE PRESENTATION

- Introduction
- Objectives
- Literature Review
- Methodology
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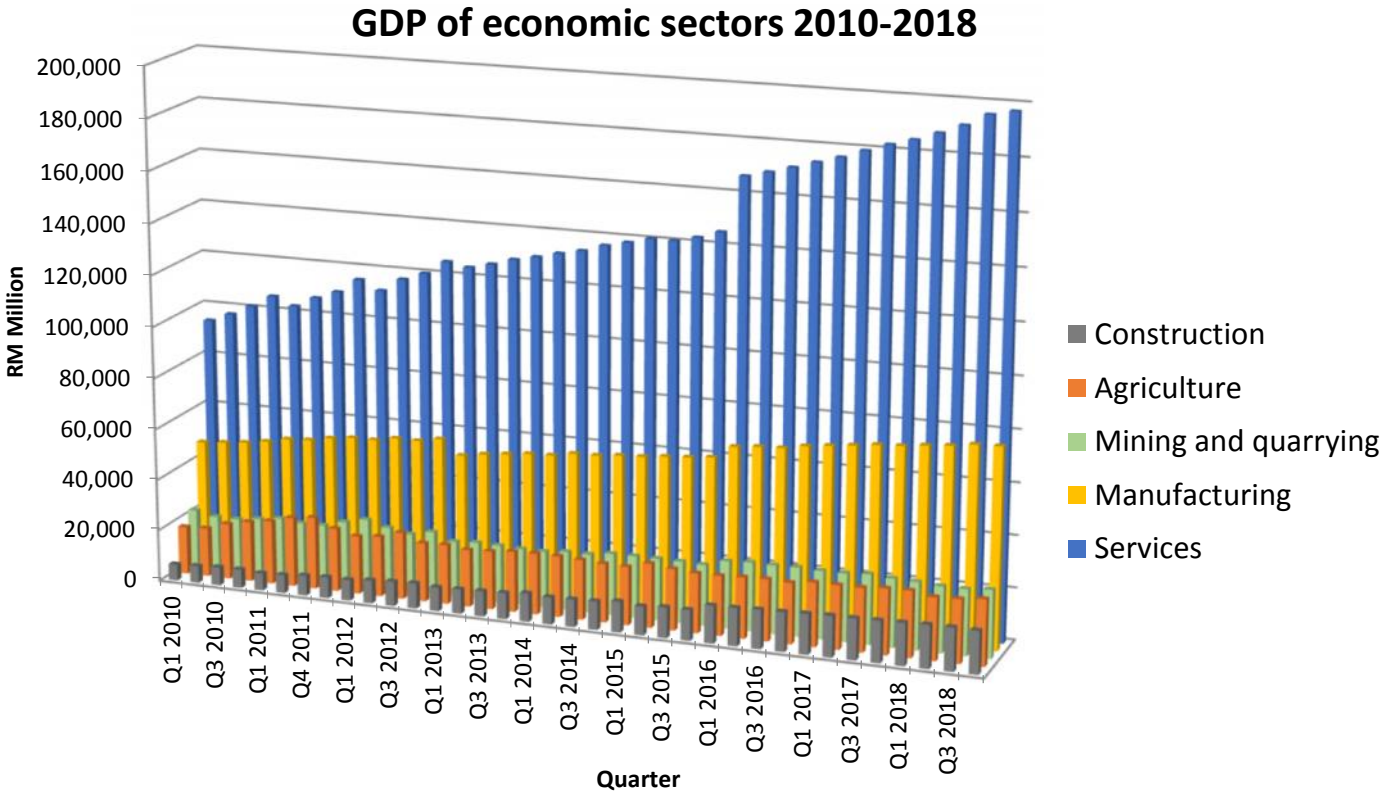
- Conclusion dan Recommendations

OVERVIEW OF MALAYSIA'S ECONOMY

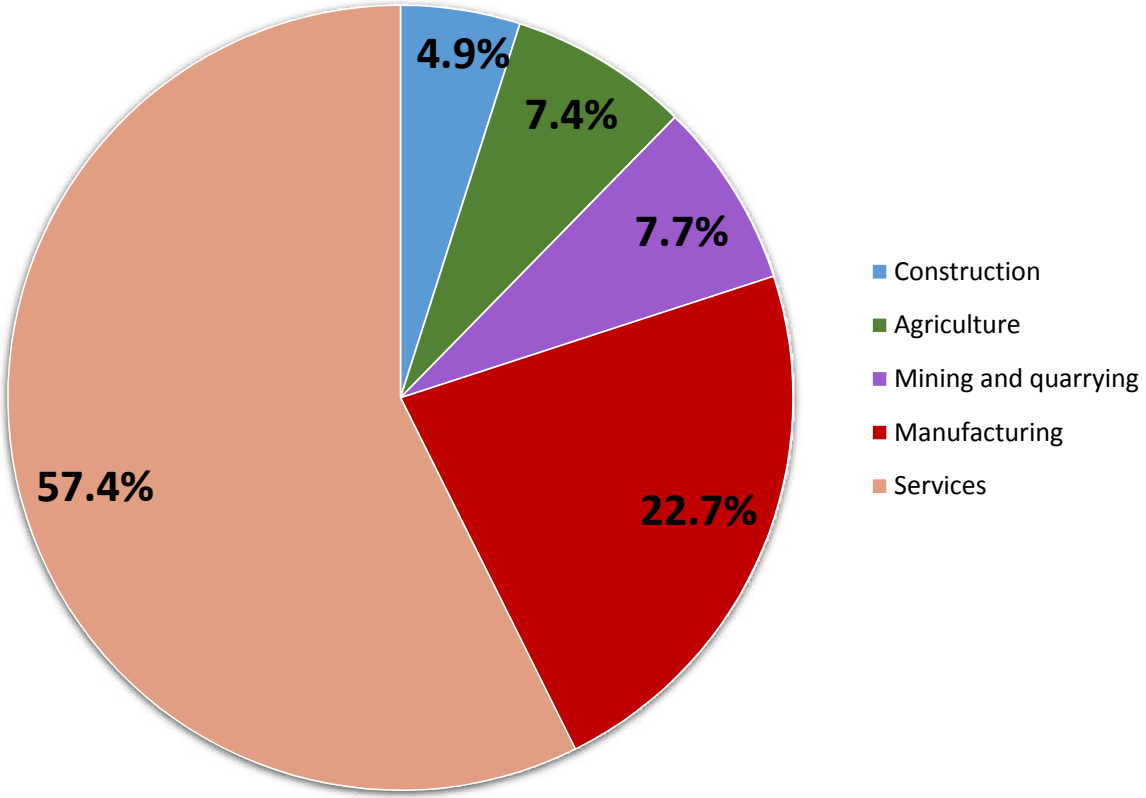


MACRO ECONOMIC KEY DATA

Gross National Income (GNI) **RM1,395.3 billion**	GNI per capita at Current Prices **RM43,086**	Gross National Savings **RM372.3 billion**
Labour Force Participation Rate **68.3%**	Unemployment Rate **3.3%**	Population **32,385 thousand**

INTRODUCTION

Percentage contributions of GDP for economic sectors (2018)



Services lead the economic

With 57.4% share of overall GDP

Manufacturing as the second biggest contributor

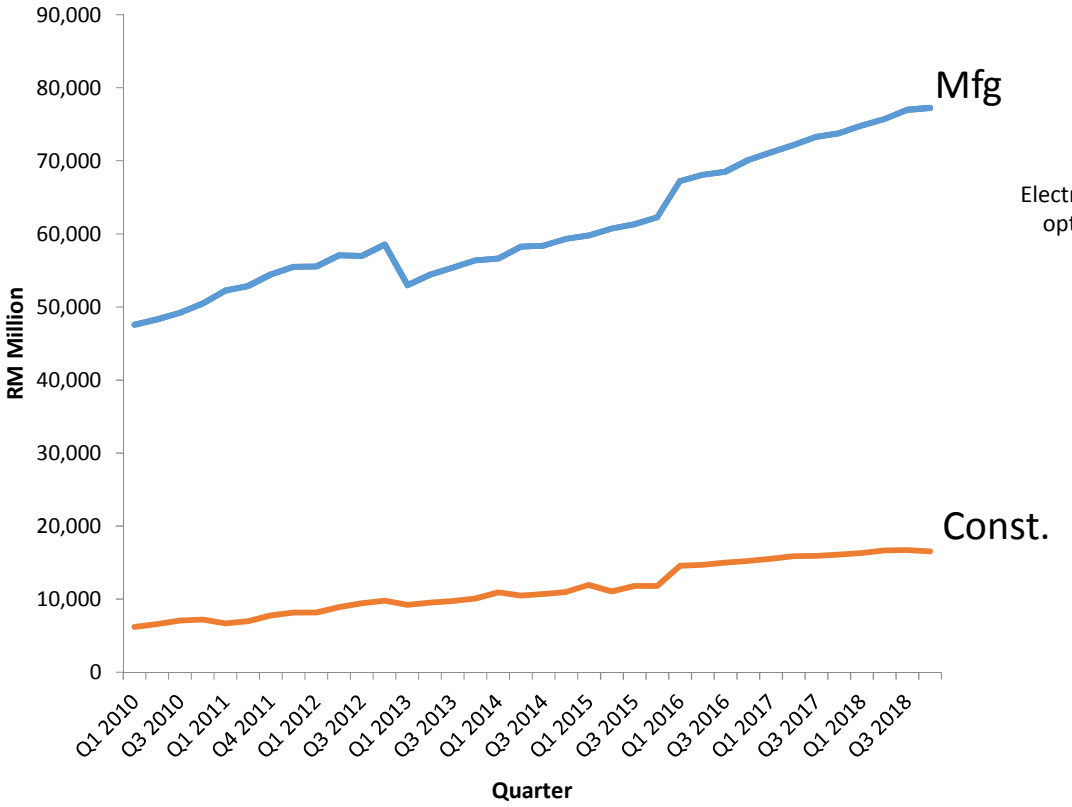
With 22.7% share of overall GDP

Construction contributes the least

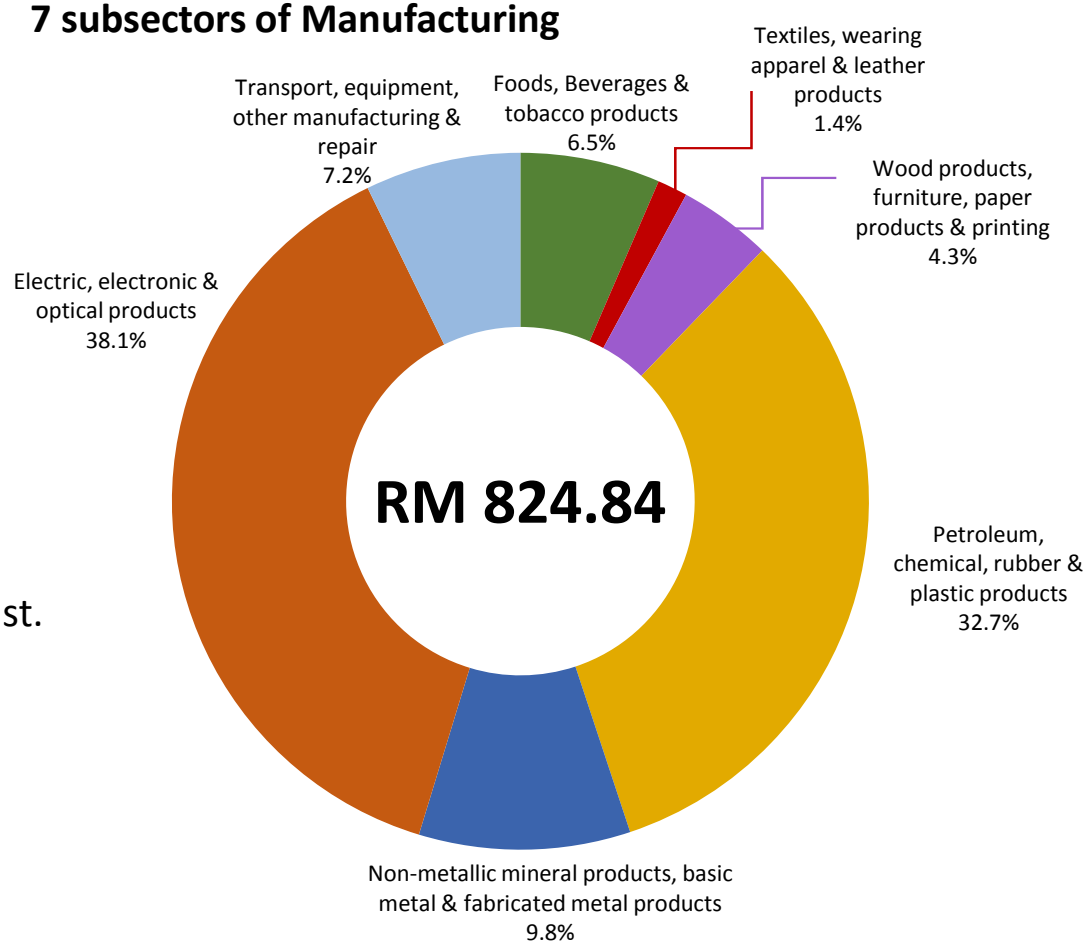
With only 4.9% share of overall GDP

INTRODUCTION

GDP of Manufacturing and Construction sector 2010-2018



Percentage contributions of sales value for 7 subsectors of Manufacturing

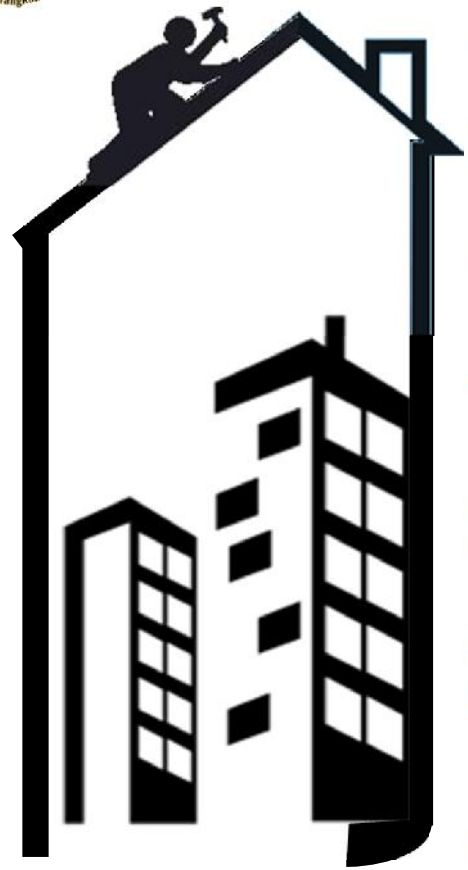


INTRODUCTION

- Non-metallic mineral products, basic metal and fabricated metal subsector's products such as hydraulic cement, concrete and aluminium are mainly used in construction sector and these products indirectly contributed to the growth of Construction sector.
- This subsector belongs to group 23, 24 and 25 in 2 digits MSIC group and the third biggest contributor of sales value for Manufacturing sector.
- For this study, we will use 5 digits MSIC of the Non-metallic mineral products, basic metal and fabricated metal subsector.
- There are 17 MSIC available under this subsector as listed.

MSIC	Descriptions
23911	Manufacture of refractory mortars and concretes
23921	Manufacture of non-refractory ceramic
23930	Manufacture of other porcelain and ceramic products
23941	Manufacture of hydraulic cement
23951	Manufacture of ready-mix and dry-mix concrete and mortars
23952	Manufacture of precast concrete, cement or artificial stone articles for use in construction
23990	Manufacture of other non-metallic mineral products n.e.c.
24101	Production of pig iron and spiegeleisen in pigs, blocks or other primary forms
24202	Production of aluminium from alumina
25113	Manufacture of metal doors, windows and their frames, shutters and gates
25120	Manufacture of tanks, reservoirs and containers of metal
25910	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
25920	Treatment and coating of metals; machining
25991	Manufacture of tins and cans for food products, collapsible tubes and boxes
25992	Manufacture of metal cable, plaited bands and similar articles
25994	Manufacture of metal household articles
25999	Manufacture of any other fabricated metal products n.e.c

INTRODUCTION



10.4%	CEMENTS AND CONCRETE MATERIALS
10.5%	IBS MATERIALS
7.4%	TILES
17.7%	IRON AND ALUMINIUM
12.3%	WOOD AND ROCK
22.8%	OTHERS (ROOF MATERIALS, ELECTRIC, ETC…)

Based on BE 2016, top 20 companies has been chosen to see their consumptions of materials related to manufacturing sector.

OBJECTIVES

First objective

- To measure the relationship between the concerned variables and their overall impact on GDP of Construction sector.

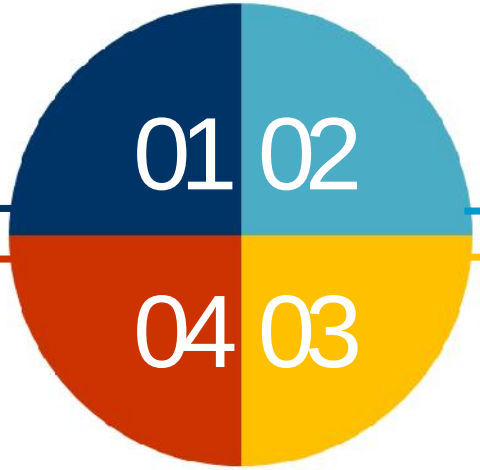
Second objective

- To investigates how the selected MSICs of Manufacturing sector are affecting the GDP of Construction sector and to identify which MSIC affects the GDP of Construction the most.

LITERATURE REVIEW

Salami & Kelikume (2011) investigates the linkage between the manufacturing and other sectors. The results obtained shows a weak linkage between the concerned variables and there is no causal relationship between manufacturing sector and real economic activities.

Pasadilla and Liao (2007) examined that globalization and pressure from increased competition have caused a stronger linkage in the service and manufacturing sectors in most economies. The study tries to shed some light on this linkage in the Philippine case and they expressed the relative contribution of services to the growth in manufacturing output as liberalization evolved.



Memon, Waqar and Muhammed (2009) investigated the causal relationships among agriculture gross domestic product (GDP) and exports in Pakistan. The outcomes tell that the major share of export has strong backward linkages with the agricultural sector both in terms of primary and value added commodities, and also a bidirectional Granger-causality between the total exports and agricultural GDP.

Pilat and Wolf (2005) focused on the interaction between services and manufacturing. They found that the distinction between both sectors is blurring. They found that the value added from the services sector to manufacturing production has increased over time and reached up to a quarter of total output by the mid-1990s. Also, they discovered a growing share of labour that officially belonged to the manufacturing sector basically engaged in service-related activities.

DATA AND METHODOLOGY

Data

- The data used in this study are the data series of manufacturing subsector of the sales value by selected 5 digits MSICs and time series data of gross domestic product (GDP) of Construction sector.

- The data were obtained from Department of Statistics Malaysia.

MULTIPLE LINEAR REGRESSION (MLR)

MLR Assumptions

- There must be a linear relationship between the outcome variable and the independent variables.
- Multivariate Normality–Multiple regression assumes that the residuals are normally distributed.
- No Multicollinearity—Multiple regression assumes that the independent variables are not highly correlated with each other.
- Homoscedasticity–This assumption states that the variance of error terms are similar across the values of the independent variables.

DATA AND METHODOLOGY

MULTIPLE LINEAR REGRESSION (MLR)

Model specification

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \ldots\ldots$$

$y = GDP\ of\ Construction\ sector$

$x_1 = independent\ variable$

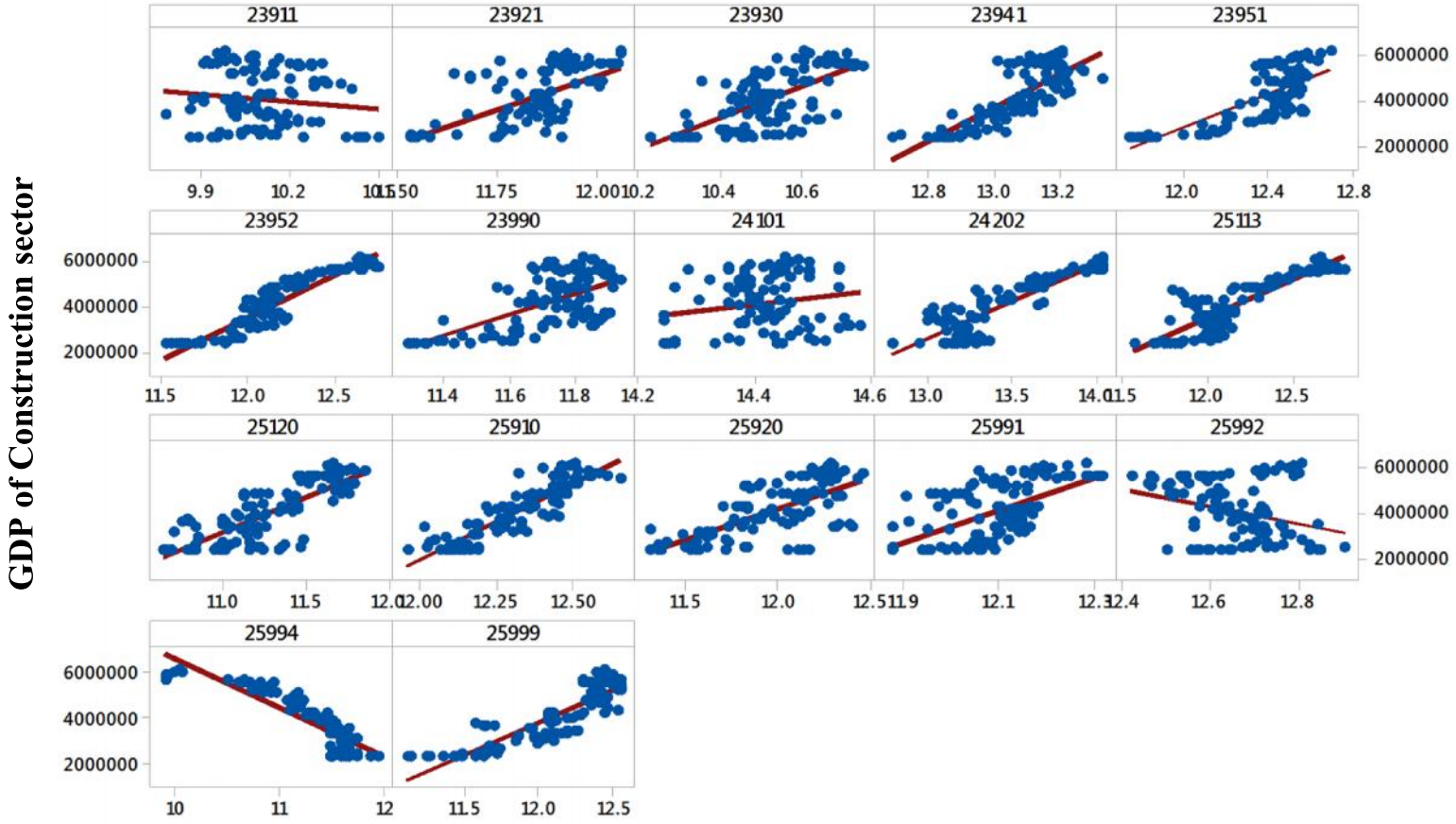
$\beta_0, \beta_i\ (i = 1,2,3,..) = coefficients$

Transformation data

$$\ln y = \beta_0 + \beta_1 \ln x_1 + \beta_2 \ln x_2 + \beta_3 \ln x_3 + \beta_4 \ln x_4 + \beta_5 \ln x_5 + \beta_6 \ln x_6 + \beta_7 \ln x_7 + \ldots\ldots$$

FINDINGS AND DISCUSSION

Scatter plot of the selected MSICs of Manufacturing sector



FINDINGS AND DISCUSSION

Correlation analysis

- The table shows the correlation value between dependent variable which is GDP of construction sector and independent variables which are the selected MSICs of manufacturing sector.
- The results show that the correlations are exist between the concerned variables.

Dependent variable	Independent variable	Correlation value
GDP Construction	23911	-0.151
GDP Construction	23921	0.69
GDP Construction	23930	0.631
GDP Construction	23941	0.85
GDP Construction	23951	0.814
GDP Construction	23952	0.912
GDP Construction	23990	0.709
GDP Construction	24101	0.211
GDP Construction	24202	0.843
GDP Construction	25113	0.849
GDP Construction	25120	0.765
GDP Construction	25910	0.899
GDP Construction	25920	0.673
GDP Construction	25991	0.56
GDP Construction	25992	-0.326
GDP Construction	25994	-0.834
GDP Construction	25999	0.908

FINDINGS AND DISCUSSION

Variables	Tolerance	VIF
(Constant)		
23911	0.580	1.724
23921	0.319	3.139
23930	0.279	3.589
23941	0.138	7.232
23951	**0.064**	**15.592** ←
23952	**0.031**	**32.030** ←
23990	0.153	6.533
24101	0.454	2.204
24202	**0.082**	**12.169** ←
25113	**0.079**	**12.648** ←
25120	0.234	4.266
25910	0.125	8.013
25920	0.364	2.747
25991	0.302	3.306
25992	0.459	2.180
25994	0.104	9.615
25999	0.110	9.086

- After testing all the assumptions, a few of insignificant MSICs has to be removed to avoid biased results.

- One way to estimate multicollinearity is using the variance inflation factor (VIF), which assesses how much the variance of an estimated regression coefficient increases when predictors are correlated (Akinwande, Dikko, and Samson, 2015) while tolerance is an indicator to show how much of the variability of the specified independent is not explained by other independent variables in the model.
- To indicate multicollinearity, value of tolerance must less than 0.10 while value of VIF must greater than 10 (Julie Pallant,2013).
- Thus, MSICs 23951, 23952, 24202 and 25113 were removed before rerun the analysis.

FINDINGS AND DISCUSSION

Table 2 Model summary

Model	R	R square	Adjusted R square
1	0.981	0.963	0.958

- From the coefficient analysis of determination, as indicated in R^2 , the represented value of 96.3% variation in GDP of Construction sector can be explain by these seven independent variables.

FINDINGS AND DISCUSSION

Variables	Coefficient	t-statistics	p-value	
(Constant)	8.442	4.490	0.000	
23911	**-0.156**	**-2.9676**	**0.004**	⬅
23921	0.116	1.476	0.143	
23930	0.059	0.619	0.537	
23941	**0.375**	**3.424**	**0.001**	⬅
23990	0.078	1.075	0.285	
24101	-0.049	-0.445	0.657	
25120	0.001	0.037	0.971	
25910	**0.285**	**2.767**	**0.007**	⬅
25920	**0.073**	**2.346**	**0.021**	⬅
25991	0.124	1.326	0.188	
25992	**-0.389**	**-4.791**	**0.000**	⬅
25994	**-0.200**	**-7.741**	**0.000**	⬅
25999	**0.205**	**4.968**	**0.000**	⬅

- P value less than 0.05 indicates that the variable is significant.
- This proofs that the seven MSICs as bolded in the table has a very significant effect on the GDP of construction.
- Other factors that insignificant to the regression model (p-value>0.05) are ignored.

FINDINGS AND DISCUSSION

$$\ln GDP = 8.442 - 0.156\ln(23911) + 0.375\ln(23941) + 0.285\ln(25910) + 0.073\ln(25920)$$
$$-0.389\ln(25992) - 0.200\ln(25994) + 0.205\ln(25999)$$

- 1% increase in the manufacture of hydraulic cement (23941) will increase GDP of construction sector by 0.36%
- 1% increase of forging, pressing, stamping and roll-forming of metal; powder metallurgy manufacture (25910) will increase 0.28% of GDP construction.
- 1% of the treatment and coating of metals; machining manufacture (25920) will increase GDP by 0.07%
- 1% increase in the manufacture of any other fabricated metal products (25999), will increase GDP of construction sector by 0.2%

CONCLUSION & RECOMMENDATIONS

CONCLUSION

- For our first objective, based on correlation results, we can say that all the MSICs selected are correlated to the GDP of Construction.
- Based on the regression equation obtained, we can see that MSICs 23941,25910,25920 and 25999 have a positive relationship with GDP of Construction due to positive values of their coefficients.
- According to the coefficient, manufacture of hydraulic cement (23941) is the highest contributor to the GDP of Construction sector.

RECOMMENDATIONS

- In the future, maybe we can try to investigate the relationship between the selected MSICs of Manufacturing sector and GDP of Construction sector by using another method such as Granger causality and Vector Error Correction Model (VECM).
- Also include forecasting using the regression model in future study.

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TERIMA KASIH & THANK YOU

HARI STATISTIK NEGARA	ISI World Statistics Congress ISI 2019 Kuala Lumpur	WORLD STATS RUN 2019	BANCI PENDUDUK & PERUMAHAN MALAYSIA 2020	HIES/BA 2019	WRC 2019	SUSTAINABLE DEVELOPMENT GOALS MALAYSIA
20 OKT	18 - 23 OGOS 2019	18 OGOS 2019	JULAI 2019 (BANCI PERCUBAAN) JULAI 2020 (BANCI SEBENAR)	JAN – DIS 2019	MAC – SEPT 2019	2016 - 2030

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