Regression Analysis of Value of Construction Work Done

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Problem statement

The Quarterly Construction Survey (QCS) is conducted four times a year.

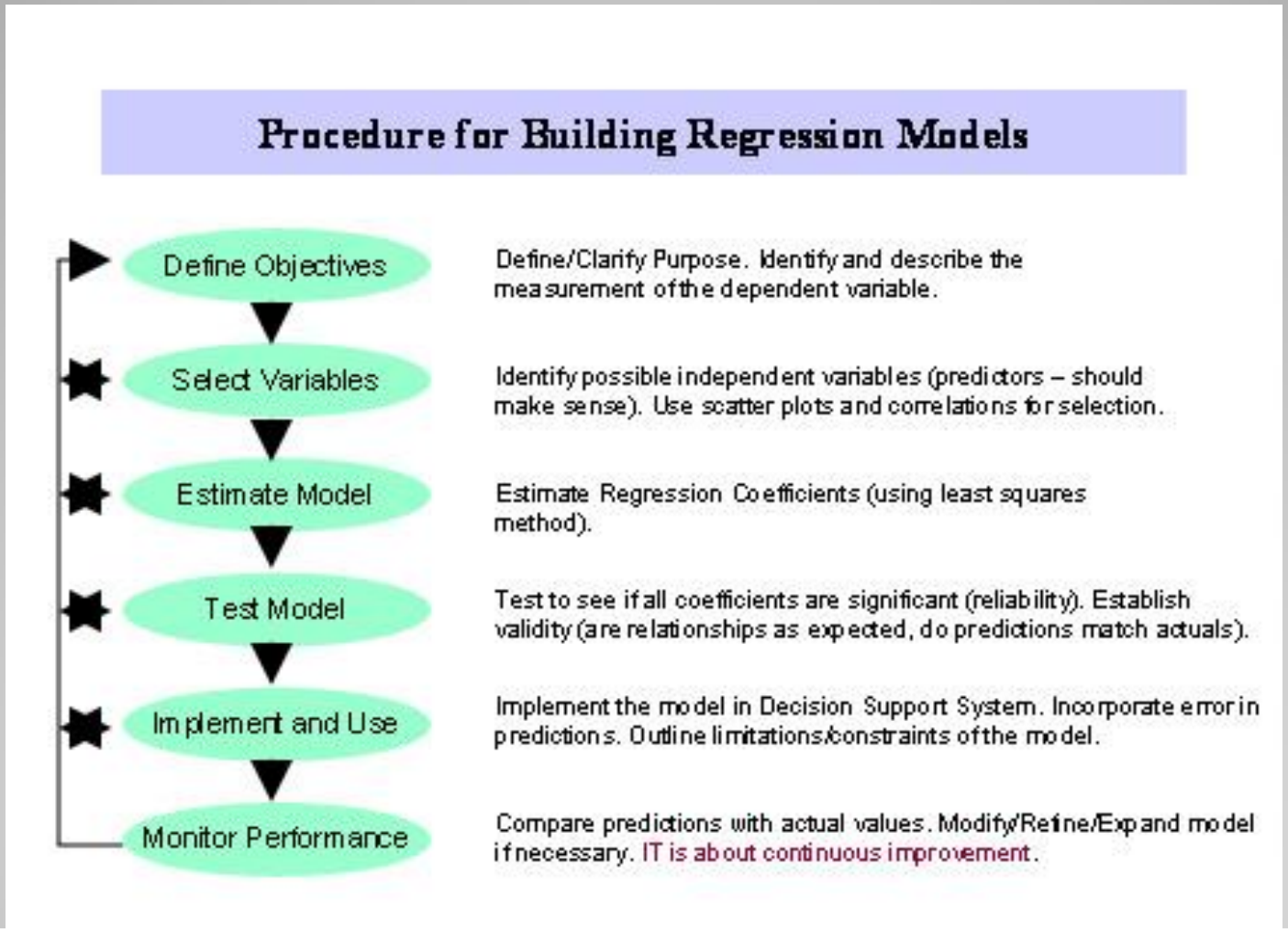
At the moment, the forecast of value of construction work done is considered only for one-step ahead, and carried out through regression analysis using excel.

Hence, this study aims to build a **regression model** using SPSS so that projections can be made for more than one quarter up to a year or more.

Study objectives

- To identify correlations between value of work done and other variables
- To build a regression model of value of construction work done
- To build regression models of value of construction work done by sub-sectors

Conceptual framework



Methodology

For every project undertaken, Bank Negara Malaysia (BNM) will provide loans disbursed and loans approved.

Several other factors such as the number of projects, the value of the new project contract, the balance of the contract value and the total balance of contract value are found to affect the value of construction work done in Malaysia.

Therefore, regression analysis is carried out to identify the relationship that exists between the value of the construction work done and those factors.

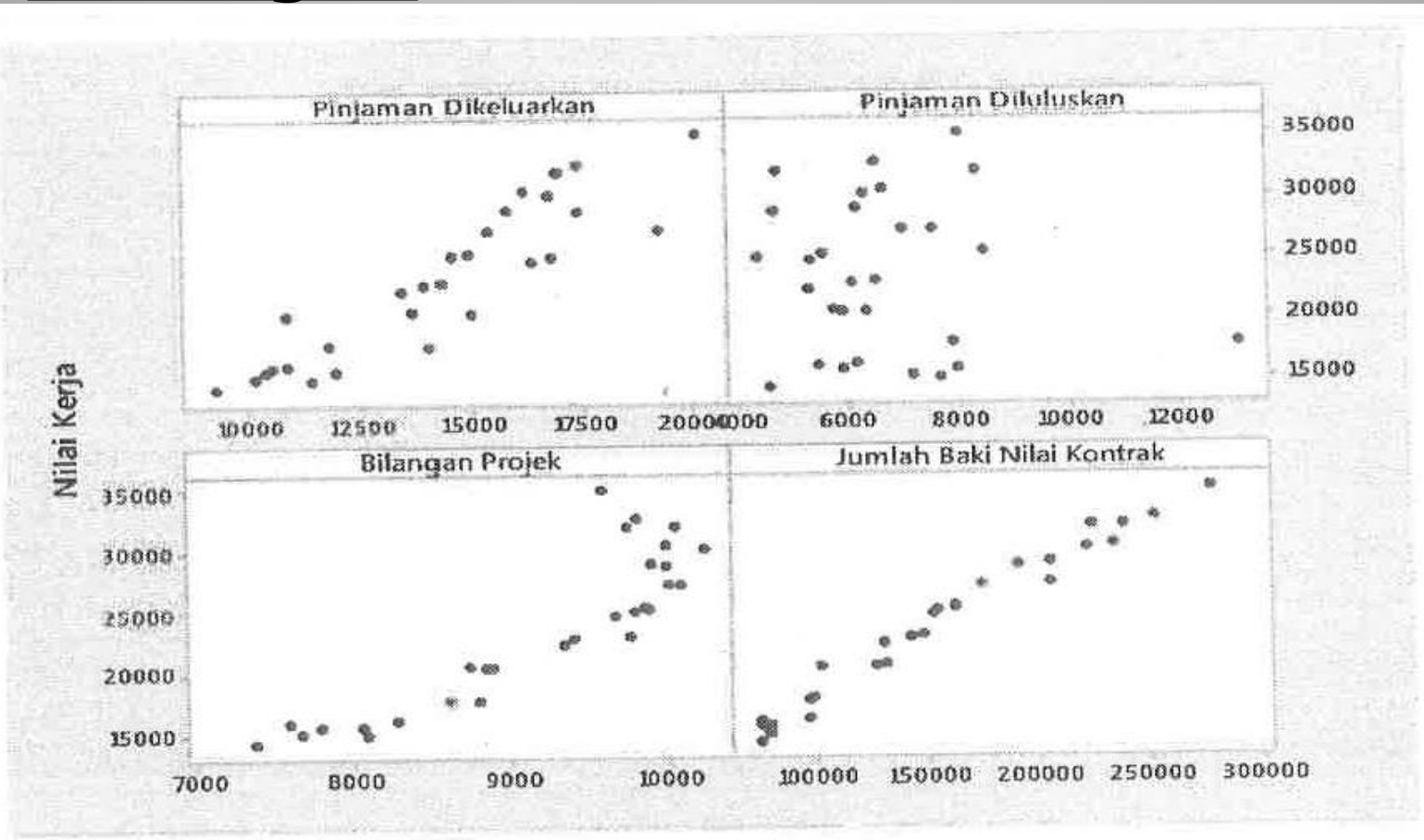
Scatter plots are made first to get visual view.

Methodology (con't)

- Data used are from Q1 2010 to Q1 2017
- The software used are SPSS and minitab
- Correlation and multiple regression analysis are used to estimate the relationships among variables
- Dependent variable is the value of construction work done
- Independent variables are;

    i. Loans disbursed
    ii. Loans approved
    iii. Number of projects
    iv. Total balance of contract value

- **Findings I**


Pinjaman Dikeluarkan
Pinjaman Diluluskan
Nilai Kerja
35000
30000
25000
20000
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12500
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17500
20000
4000
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10000
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Bilangan Projek
Jumlah Baki Nilai Kontrak
35000
30000
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15000
7000
8000
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10000
100000
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200000
250000
300000

Findings I (con't)

- 4 correlations analysis were run using minitab
- Results are as follows

Dependent var.	Independent var.	Correlation value
Value of construction work done	Loans disbursed	0.908
Value of construction work done	Loans approved	-0.115
Value of construction work done	Number of projects	0.885
Value of construction work done	Total balance of contract value	0.987

Findings I (con't)

Analysis of Variance					
Source	DK	Adj SS	Adj MS	f-value	P-value
Regression	4	1092408716	273102179	438.22	0.000
Loans disbursed	1	1955042	1955042	3.14	0.089
Loans approved	1	2064611	2064611	3.31	0.081
Number of projects	1	4572552	4572552	7.34	0.012
Total balance of contract value	1	129533927	129533927	207.85	0.000
Error	24	14956874	623203		
Total	28	1107365590			

Result shows that the p-value for the total balance of contract value is 0.000 which is < 0.05, this proofs that the total balance of contract value has a very significant effect on the value of construction work done.

Other factors that do not affect significantly the regression model (p-value>0.05) are removed.

Findings II

- Regression Analysis : Value of construction work done vs total balance of contract value

Analysis of Variance					
Source	DK	Adj SS	Adj MS	F-value	P-value
Regression	1	1078179527	1078179527	997.42	0.000
Total Balance of Contract Value	1	1078179527	1078179527	997.42	0.000
Error	27	29186062	1080965		
Total	28	1107365590			
Model summary					
S		R-sq		R-sq(adj)	R-sq(pred)
1039.69		97.36%		97.27%	96.96%

Findings II (con't)

Coefficients					
Term	Coef	SE Coef	T-value	P-value	VIF
Constant	7969	523	15.25	0.000	
Total balance of contract value	0.10169	0.00322	31.58	0.000	1.00

- The regression equation for value of construction work done is ;

Value work done=7969+0.10169 Total balance of contract value

7969 is a constant value
0.10169 is the coefficient of total balance of contract value

From the equation, for every increase of total balance of contract value, the value of construction work done will increase by 0.10169. Using the equations obtained, the value of construction work done for the future is predictable.

- The value of work done for Q2 and Q3 2017 have been predicted as below;

Quarter/Yr	Predicted Value of work done	Actual value of work done	% error
2/2017	35779	33825	5.78%
3/2017	34879	?	

Findings III

Using the same method, the regression equations are made for the four main sub-sectors. The details are as follows;

Subsector	Regression equation	Explanation
Residential buildings	**y=1190+0.13453(x)** y=value of work done x=total balance of contract value R2=97.98%	• for every increase in the total balance of contract value, the value of work done will increase by 0.13453 • the total balance of contract value may explain 97.98% variation in the value of work done
Non-residential buildings	**y=3467+0.09587(x)** y=value of work done x=total balance of contract value R2=90.36%	• for every increase in the total balance of contract value, the value of work done will increase by 0.09587 • the total balance of contract value may explain 90.36% variation in the value of work done

Findings III (con't)

Subsector	Regression equation	Explanation
Civil engineering	**y=2693+0.08478(x)** y=value of work done x=total balance of contract value R2=89.06%	• for every increase in the total balance of contract value, the value of work done will increase by 0.08478 • the total balance of contract value may explain 89.06% variation in the value of work done
Special trades activities	**y=652+0.1034(x)** y=value of work done x=total balance of contract value R2=52.30%	• for every increase in the total balance of contract value, the value of work done will increase by 0.1034 • the total balance of contract value may explain 52.30% variation in the value of work done

Limitations of study

Although regression analysis is fairly accurate, there are some limitations, thus the need for caution;

- Statistical knowledge and statistical software are required in order to be able to perform test
- There is a need for much data, however some data may not be available/ time series data must be sufficient
- Regression analysis uses past data and may not be relevant to rapidly changing events, thus invalidating past relationship

Importance of study

Regression analysis helps in 2 important ways;

i. It provides estimate of values of dependent variables from values of independent variables; (in this case value of work done is estimated from total balance of contract value).

ii. It shows the nature of relationship between variables.

Conclusions and suggestions

- This model is still not stable enough and needs to be improved as only one independent variable is found to be significant to explain the variation in the value of the work done.
- This is just the result of the current study and improvements to the model need to be continued.

Thank You