FORECASTING MALAYSIAN GDP : AN ARIMAX APPROACH

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OUTLINE

INTRODUCTION

- In the developed word, the model tools for calculation Gross Domestic Product (GDP) estimates are based on quantitative time series data which include indicators that significantly determine GDP development

- Result of BTS is published in the form of net balance and confidence indicators (CI) conveying the expectations of economic entities over the next three months

- Confidence Indicator: short term indicator which summarize the overall view of business situation in various sectors in Malaysia

- The CI is computed as average of the net balance for selected variables

- The Leading Index (LI) measures anticipation of the overall economic activity in the months ahead. The index tell us where the economy is going.

- As a result, they can be an important source of information for computing flash estimates or short-term predictors for the development of macroeconomic.

LITERATURE REVIEW

i. Jan Haluska (2006)

-Present the methodological approach and econometric type model relationships that use economic sentiment indicator (ESI) to represent GDP development

-ESI can be considered a statistically significant indicator of GDP development and it may be used to construct model relationships for flash estimates of GDP

ii. Annabelle Mourougane and Moreno Roma (2002)

- Investigate the usefulness of the European Commission confidence indicators (CI) in forecasting real GDP growth rates in the short-run in selected Euro area countries (Belgium, Spain, Germany, France, Italy and the Netherlands) which account for almost 90% of the euro area

- Estimate a linear relationship between real GDP and CI and compared the forecasting performance of the estimated models with a benchmark ARIMA model

- Generally CI can be useful in forecasting real GDP growth rates in the short run in Belgium, Germany, France, Italy and Netherlands

iii. Vit Posta and Zdenek Pikhart (2012)

- Perform a quantitative analysis of the possibilities of Sentiment Economic Indicator based on the joint harmonized EU programme of business and consumer surveys to forecast quarterly GDP growths as a result of the publication lag of the data on GDP

- Construct ARMAX models to capture the relationship between quarterly changes in GDP and the Sentiment Economic Indicator.

v. Martina Karlsson and Helen Orselius (2014)

- Examine Swedish indicators and observe if they are stable, and provide accurate, reliable and consistent signals in relation to GDP growth

-Ten indicators within the categories financial, survey-based and real economy indicators are selected

-The statistical tests include Correlation, Cross-correlation and Simple Linear Regression, an interaction term is also included to account for financial crisis

METHODOLOGY

- Data source was obtain from DOSM

GDP

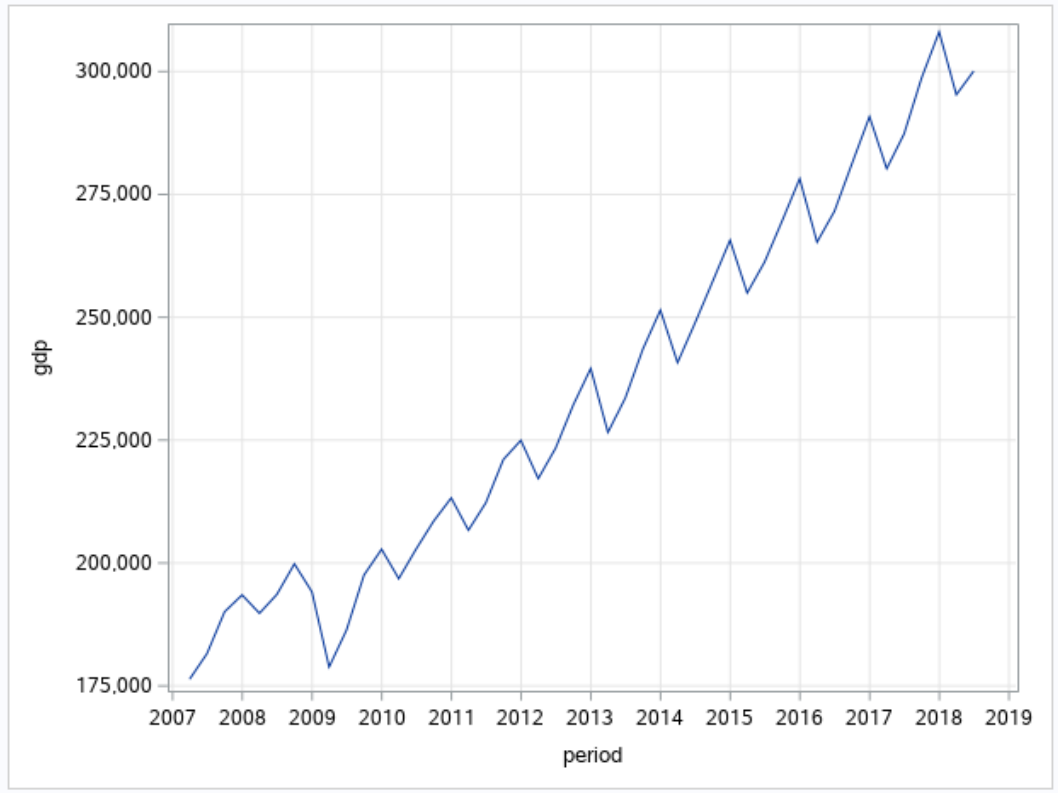
CI

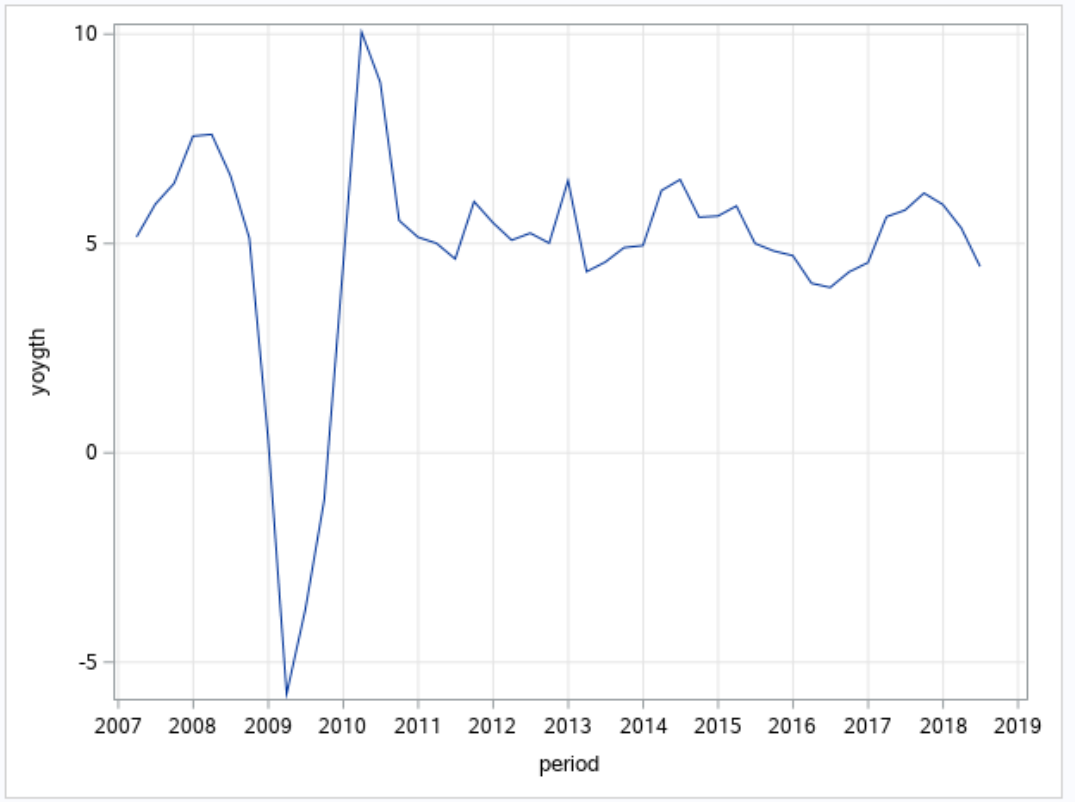
LI

Q3 : 2010 – Q2 : 2018

- SAS (and R) was used to develop model
- ARIMA Model
- ARIMAX model
- Period of forecast = 4 head & period of hold back = 4

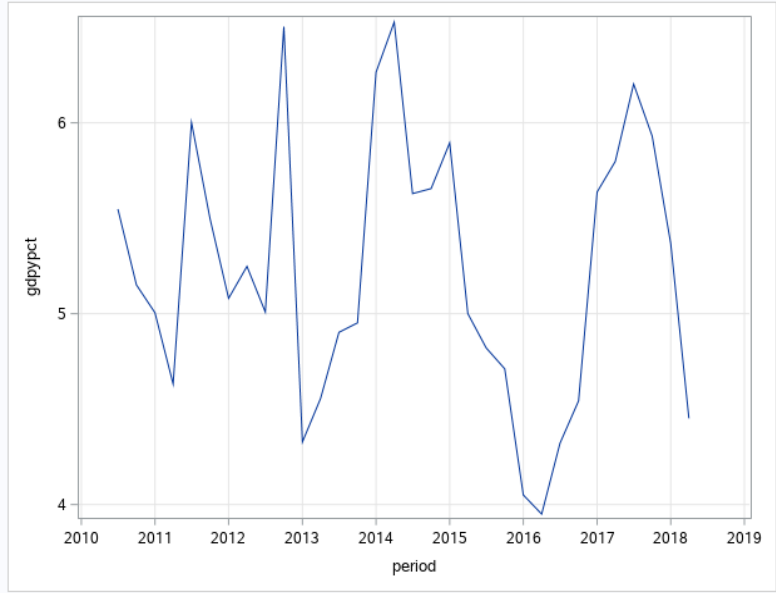
METHODOLOGY (cont.)

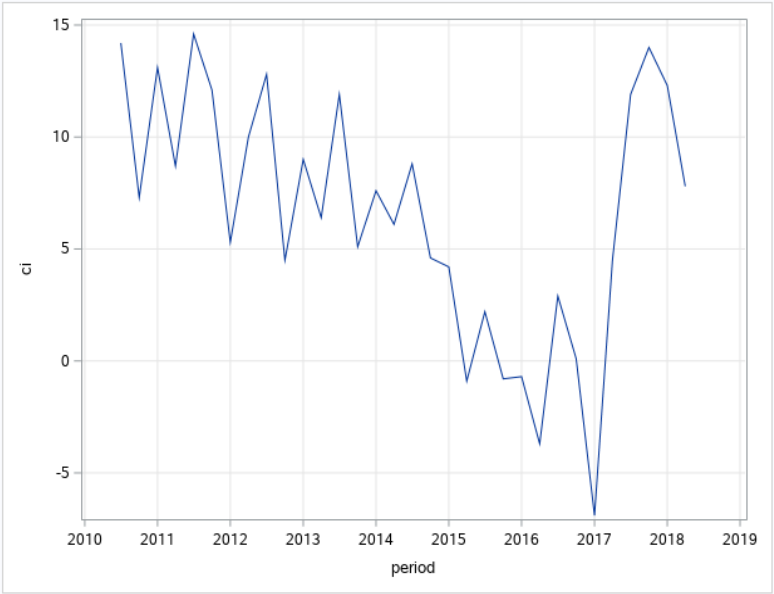


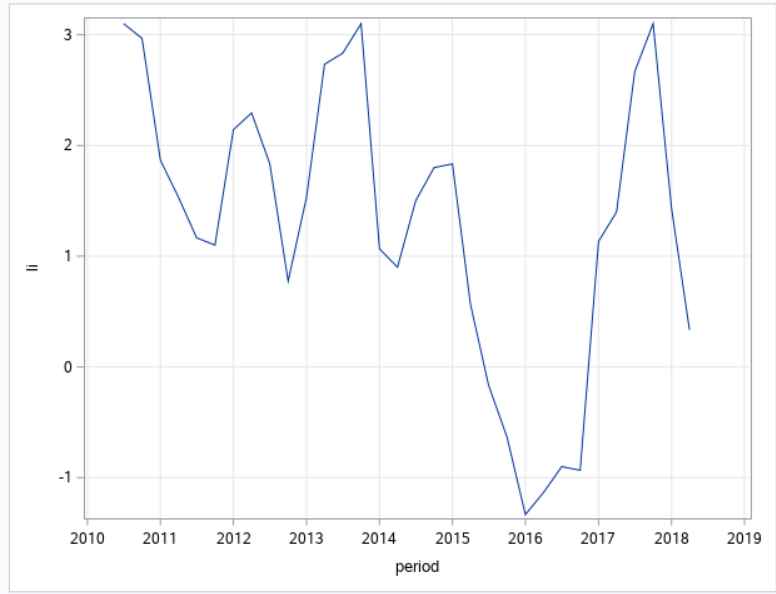


METHODOLOGY (cont.)

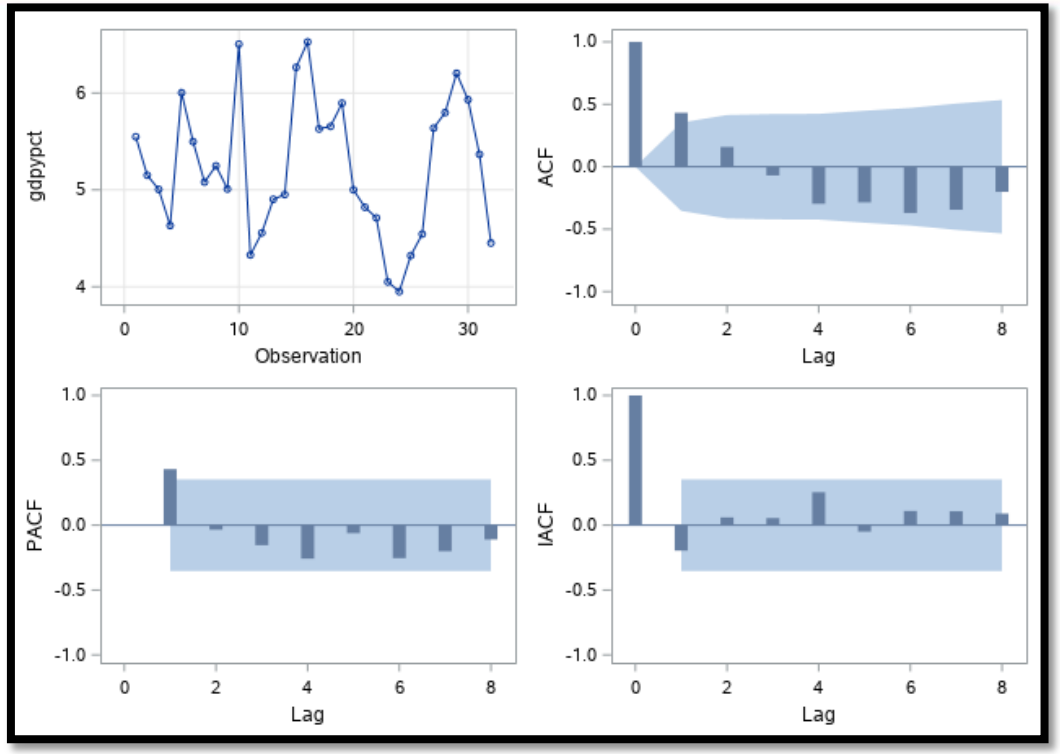
Q3 : 2010 – Q2 : 2018







FINDINGS



Augmented Dickey-Fuller Unit Root Tests							
Type	Lags	Rho	Pr < Rho	Tau	Pr < Tau	F	Pr > F
Zero Mean	0	-0.4920	0.5654	-0.63	0.4343		
	1	-0.2926	0.6100	-0.46	0.5041		
	2	-0.2181	0.6207	-0.37	0.5421		
Single Mean	0	-17.0305	0.0113	-3.24	0.0264	5.31	0.0381
	1	-18.2087	0.0073	-2.80	0.0702	3.93	0.1014
	2	-30.1184	0.0001	-2.85	0.0630	4.08	0.0924
Trend	0	-17.0486	0.0672	-3.19	0.1040	5.13	0.1912
	1	-18.2725	0.0458	-2.76	0.2237	3.86	0.4308
	2	-31.1993	0.0003	-2.83	0.1973	4.11	0.3834

Suggested model
ARIMA (1,0,0)

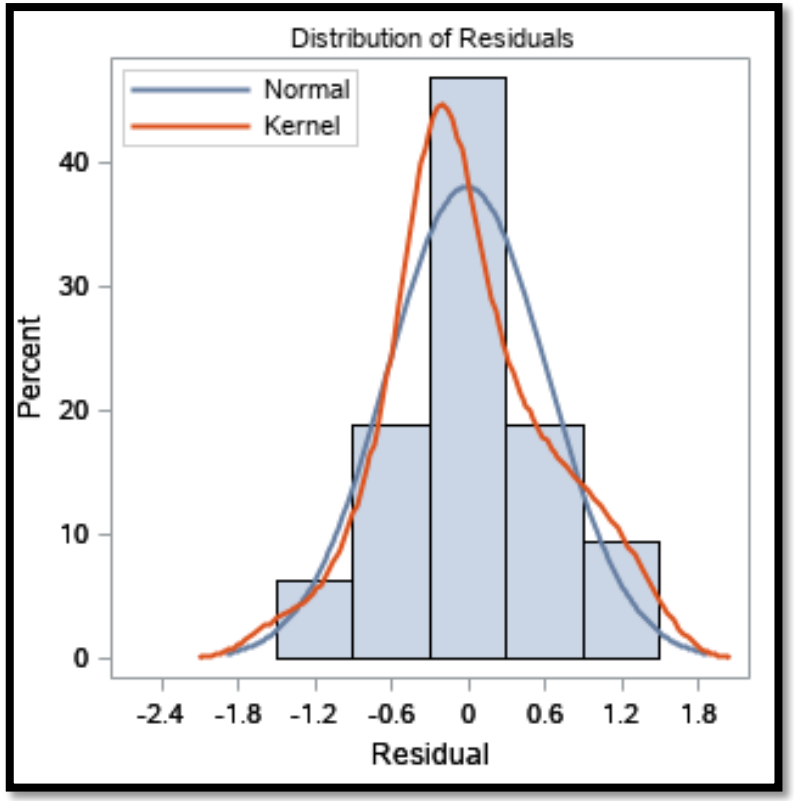
```
auto.arima(data2$gdpypct)
Series: data2$gdpypct
ARIMA(1,0,0) with non-zero mean

Coefficients:
         ar1    mean
      0.4386  5.2136
s.e.  0.1586  0.1904

sigma^2 estimated as 0.4086:  log
likelihood=-30.16
AIC=66.32   AICc=67.18   BIC=70.72
```

FINDINGS (cont.)

Maximum Likelihood Estimation					
Parameter	Estimate	Standard Error	t Value	Approx Pr > |t|	Lag
MU	5.21363	0.19614	26.58	<.0001	0
AR1,1	0.43859	0.16659	2.63	0.0085	1

Constant Estimate	2.92699
Variance Estimate	0.408586
Std Error Estimate	0.639207
AIC	64.31875
SBC	67.25022
Number of Residuals	32

Correlations of Parameter Estimates		
Parameter	MU	AR1,1
MU	1.000	-0.061
AR1,1	-0.061	1.000



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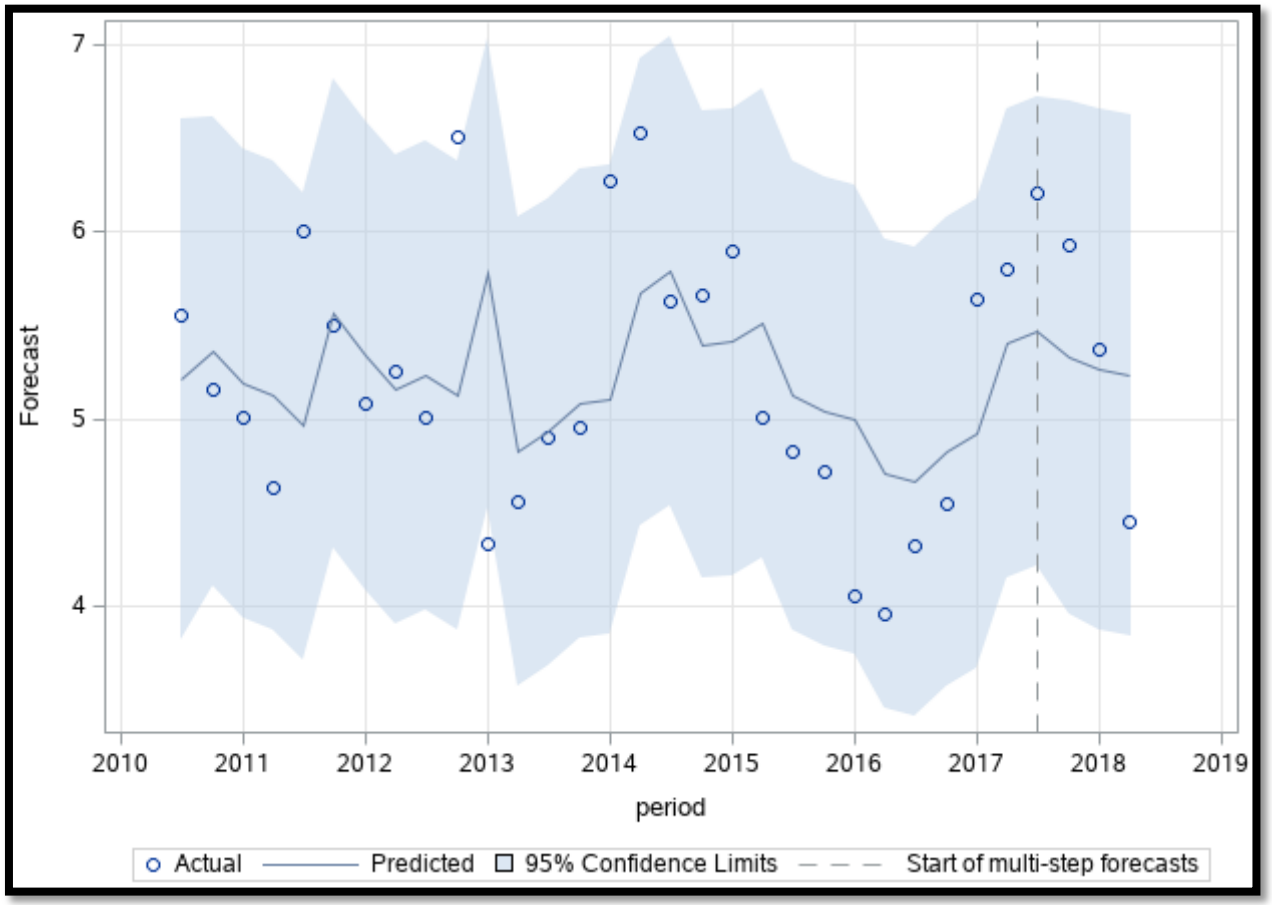
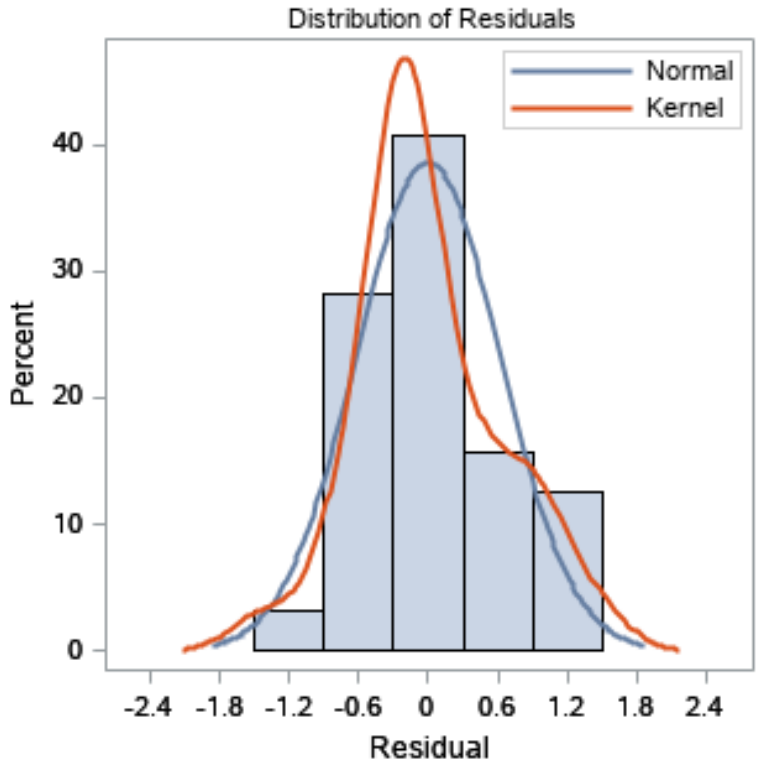


Forecasts for variable gdpypct						
Obs	Forecast	Std Error	95% Confidence Limits		Actual	Residual
30	5.4698	0.6392	4.2170	6.7226	6.2033	0.7335
31	5.3260	0.6980	3.9580	6.6940	5.9302	0.6043
32	5.2629	0.7087	3.8738	6.6520	5.3667	0.1038
33	5.2352	0.7108	3.8421	6.6283	4.4514	-0.7838

FINDINGS (cont.)

ARIMAX - CI



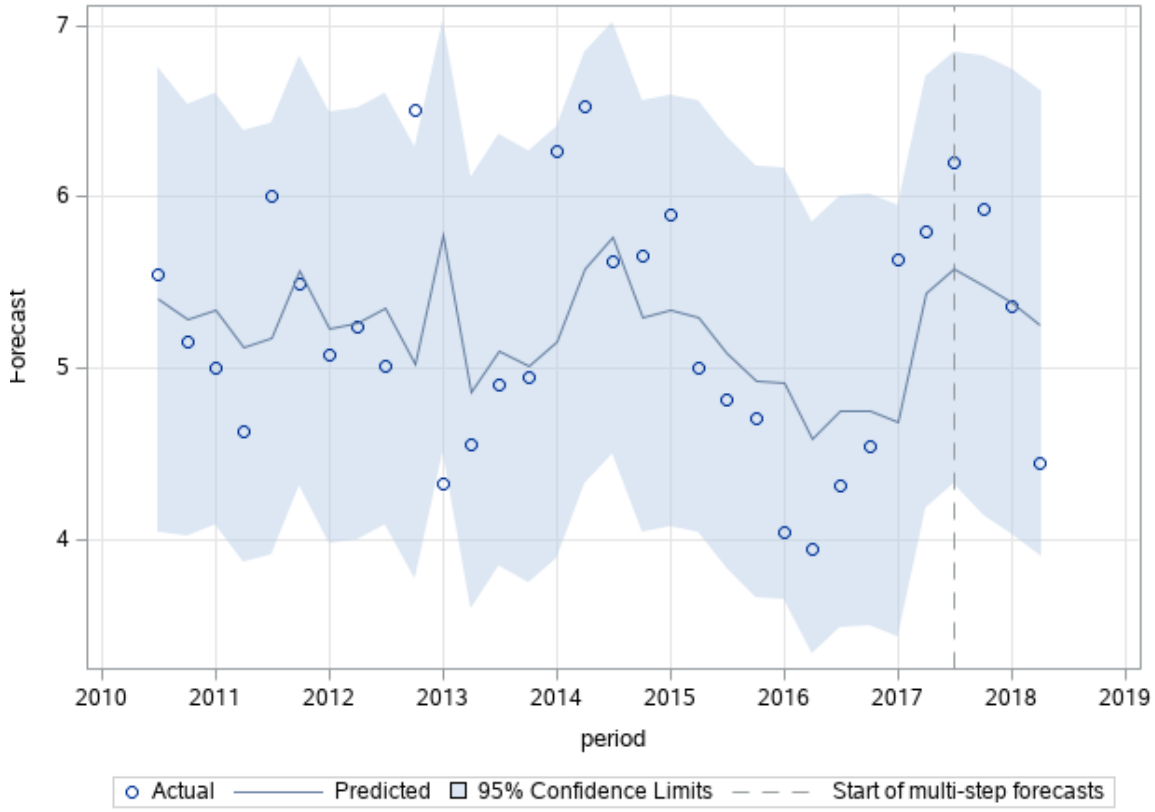
Model for variable gdpypct	
Estimated Intercept	5.049681

Autoregressive Factors	
Factor 1:	1 - 0.37128 B**(1)

Input Number 1	
Input Variable	ci
Overall Regression Factor	0.024875

Constant Estimate	3.174856
Variance Estimate	0.411291
Std Error Estimate	0.641319
AIC	65.37973
SBC	69.77694
Number of Residuals	32

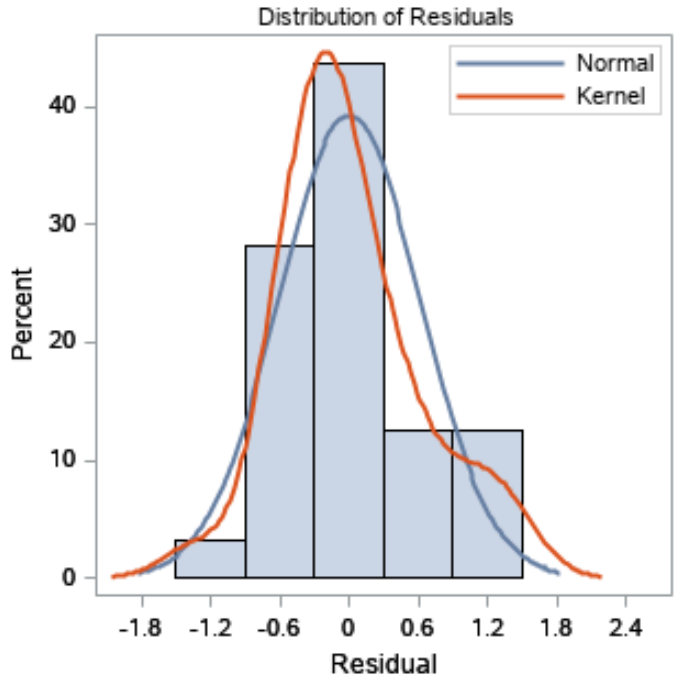
FINDINGS (cont.)



Forecasts for variable gdpypct						
Obs	Forecast	Std Error	95% Confidence Limits		Actual	Residual
29	5.5819	0.6413	4.3249	6.8388	6.2033	0.6214
30	5.4856	0.6841	4.1448	6.8264	5.9302	0.4446
31	5.3882	0.6898	4.0362	6.7401	5.3867	-0.0215
32	5.2558	0.6906	3.9023	6.6093	4.4514	-0.8043

FINDINGS (cont.)

ARIMAX - LI



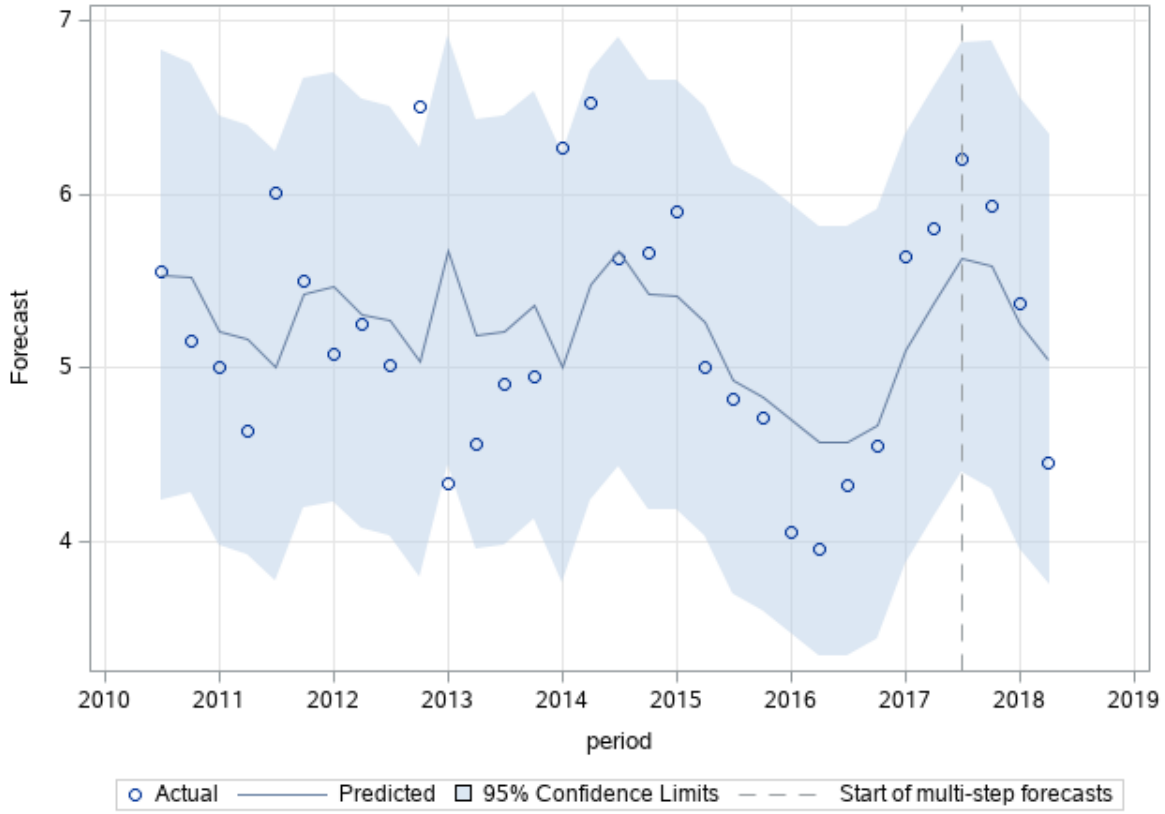
Model for variable gdpypct	
Estimated Intercept	4.98569

Autoregressive Factors	
Factor 1:	1 - 0.30235 B**(1)

Input Number 1	
Input Variable	li
Overall Regression Factor	0.177281

Constant Estimate	3.478273
Variance Estimate	0.397565
Std Error Estimate	0.630528
AIC	64.24116
SBC	68.63837
Number of Residuals	32

FINDINGS (cont.)



Forecasts for variable gdpypct						
Obs	Forecast	Std Error	95% Confidence Limits		Actual	Residual
30	5.6289	0.6305	4.3931	6.8647	6.2033	0.5744
31	5.5868	0.6587	4.2957	6.8779	5.9302	0.3434
32	5.2554	0.6612	3.9594	6.5514	5.3667	0.1113
33	5.0495	0.6615	3.7530	6.3459	4.4514	-0.5981

FINDINGS (cont.)

Model	AIC	MAPE	MAD
ARIMA	64.32	10.39	0.56
ARIMAX-CI	65.38	9.00	0.47
ARIMAX-LI	64.24	7.64	0.26

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TERIMA KASIH & THANK YOU

HARI STATISTIK NEGARA	ISI 2019 Kuala Lumpur 62nd ISI World Statistics Congress 18 - 23 August 2019	POPULATION & HOUSING CENSUS MALAYSIA 2020 YOUR DATA IS OUR FUTURE	HIES/BA 2019 Data Shaping People's Wellbeing	WRC 2019 Kaji Perdagangan Borong & Runcit Wholesale & Retail Trade Census	SUSTAINABLE DEVELOPMENT GOALS MALAYSIA
20 OCT	18 - 23 AUG 2019	JULY 2020 (ACTUAL MYCENSUS)	JAN – DEC 2019	MAR – SEPT 2019	2015 - 2030

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