3651-7562-1-SM

by dodi mulyadi

General metrics

11,672	1,679	338	6 min 42 sec	12 min 54 sec
characters	words	sentences	reading time	speaking time

Score

This text scores better than 44% of all texts checked by Grammarly

Writing Issues

193	158	35
Issues left	Critical	Advanced

Plagiarism

This text seems 100% original. Grammarly found no matching text on the Internet or in ProQuest's databases.

Writing Issues

175	**Correctness**	
27	Misspelled words	
9	Unknown words	
4	Mixed dialects of english	
33	Determiner use (a/an/the/this, etc.)	
51	Improper formatting	
5	Incorrect verb forms	
6	Comma misuse within clauses	
4	Incorrect noun number	
2	Incomplete sentences	
5	Punctuation in compound/complex sentences	
4	Wrong or missing prepositions	
1	Modal verbs	
3	Faulty subject-verb agreement	
7	Pronoun use	
1	Redundant words	
1	Incorrect phrasing	
12	Confused words	
11	**Clarity**	
11	Passive voice misuse	
7	**Engagement**	
6	Word choice	
1	Monotonous sentences	

Unique Words

Measures vocabulary diversity by calculating the percentage of words used only once in your document

21%

unique words

Rare Words

Measures depth of vocabulary by identifying words that are not among the 5,000 most common English words.

34%

rare words

Word Length

Measures average word length

3.6

characters per word

Sentence Length

Measures average sentence length

5

words per sentence

3651-7562-1-SM

International Seminar on Education and Development of
Asia
1st INseIDEA Saturday, July 14th, 2018

ISBN: 978-602-5614-24-8

Page 297

MODELLING JAKARTA COMPOSITE INDEKS USING SPLINE TRUNCATED

Alan Prahutama1, Suparti2, Sugito3 dan Tiani Wahyu Utami4

1,2,3 Statistics Department, Diponegoro University, Semarang, Indonesia
4Statistics Department, University of Muhammadiyah Semarang, Semarang, Indonesia
1alan.prahutama@gmail.com, 2suparti702@gmail.com,
3sugitostat@gmail.com, 4tiani.utami@gmail.com,

Abstract

Regression analysis can be done by parametric and nonparametric approach. The nonparametric approach does not assume an assumption compared to parametric. One nonparametric approach is the spline truncated. Spline is a polynomial piece that provides high flexibility. Spline modeling requires spline and knots. To determine the knots using General Cross Validation (GCV). In this study modeled the value of Jakarta Composite Index (JCI). JCI provides benefits to know the overall stock price in the stock exchange Indonesia. In this study the best spline model is linear with three knots with R square is 94.34%.

Keywords: Jakarta Composite's Index, Spline truncated, GCV.

Introduction

Regression is one of the statistical methods to model the relationship between response variables and predictor variables. The parametric regression approach is easy, but very strict with assumptions. In contrast to parametric approach, nonparametric approach is complex to do, but do not require

Nonparametric regression is one of the approaches used to find out the relationship pattern between explanatory variable and unrecognized response of regression curve. In general, nonparametric regression has the following function form:

, n

$y_i = f(t_i) + \varepsilon_i, \quad i = 1, 2,$

assumptions. Parametric modeling is done when the

with yi
is response variable and
f (ti)
is curve of
data pattern is known, while nonparametric
regression with ti
is prediktor variable and i is
approach can be done if the data pattern is
unknown. Some nonparametric regression modeling methods have been widely used, among others, using spline truncated, local polynomial, Fourier series, Wavelet, Kernel and others. Spline regression truncated is a segmented regression
model-segment in the form of piecewise
polynomial. This segmented nature provides spline benefits compared to other methods. Spline truncated modeling procedures include determining the spline order and selecting the optimum knot point. Determination of optimum knot point using CV (Cross Validation) and GCV (General Cross Validation).
residual of model (Wahba, 1990).

2.1. Spline Regression

Spline is a segment of a segmented polynomial (piecewise polynomial) that has flexibility properties. The nature of flexibility is what distinguishes the spline with the polynomial. The joint fusion point of the pieces or points indicating changes in the behavior of the curve at different intervals.
In general the spline function of the order is any function that can be written in form (Eubank,
1988):

m M

Composite Stock Price Index (CSPI) is an indicator

f (t) t j

t K m[49]

that presents the market price in Indonesia Stock

Exchange. IHSG values tend to fluctuate and have

j 1

j k k[50]

k 1

m

high[51] volatility over time. In this research will be

with t K

m t Kk ;

t K

modeled[52] the value of IHSG using Spline truncated.

k

0 ;

t K

Method

j and k

are parameter[53] of spline regression then

2.1. Nonparametric regression

K1 , K2 , , KM

are knot.

If m 1

and the number of knot is one then the

from the smallest GCV value.

form of spline model is spline linear as follow as

The GCV function is defined as:

f (t) 1t 2

t K 1

, K M)

GCV (K1 , K2 ,

MS(E2.(3K)1 , K 2 ,

, K M)

, K M)]

2

It is called spline linear with one knot for t = K It can be written as:

where

n1tr[I A(K , K ,

1t

f (t)

□; t K

□

MSE(K , K

□

p

, KM)

, n1

□

1 2

(2.4)

ˆ

f

□

2

, K p)

(t)

1t 2 t K

□; t K

□1 2 y j

□(K1 , K2 , j

Spline regression model can be written as:

m M

□

, KM

, KM y

and A K1,

□j 1

is part of equation of

y t j

t K

m

(2.5)

i j i

j 1

k 1

k i k i

yˆ A

K1, .

Then it can be written as :

3.Results and Discussions

yi 1ti i

Statistics descriptive of the Jakarta Composite

If it is written as matrix can be follow:

y t1

1

m m m

t2 t2 K1 t2 KM

y t

1

2 2

t1 t1 K1 t1 KM

m m m

1

1

m m m

mti 1 ti K1 M ti KM

m 2

Index from July 12th[89] 2016 to 2017 has mean[90] is

Y

5756.6; variance[91] is 164803.9; minimum[92] is 5027.7 and[93] maximum[94] is 6689.3. The scatter plot of the data as follow[95,96] as in[97] Figure 1. Based on Figure 1, it shows that the plot[98] has trend increased model, but

y X K1 ,

yn

n

m m m[99]

tn[100] tn[101] K1 tn[102] KM

, KM

tn[103]

in period arround[104] 384, has declined.

6800

6600

Then it can be written as:

6400

6200

with

6000

M

y y1, y2

, yn

, ,

m m m

t1 t1 K1 t1 KM

1

t

m m m

t2 t2 K1 t2 KM

, KM

t

5800

5600

5400

5200

5000

X K1 , 2

1 48

96 144

192

240

time

288

336

384

432

480

m m m[106]
tn[107] tn[108] K1 tn[109] KM

tn

,

,

,m , 1, , M

1

and

1 , 2

, n

,

2.3. Determine Optimal Knot using General Cross Validation (GCV)

Figure 1. Scatter plot of the data First step for modelling spline regression is determine the knots. To determine the knots, we could used GCV. We find the minimum of GCV, it shows that optimum knot. We find for one up three orde of spline, then we get one to three knots.

orde

Number

of Knot

Value of knot

GCV

1

1

408

23591.6

2

123; 400

1226.3

3

56;114;400

11174.89

2

1

363

14819.7

2

399;398

12197.6

3

50; 105; 400

11260.02

3

1

329

16224.8

2

116;306

16466.6

3

50;99;380

16599.5

Table 1 shows that the GCV value of spline.[121]

Table 1. GCV value of spline model

, K M[122]

Selection of the optimal knot

K1 , K 2 ,[123][124]

is very important in nonparametric regression. The knot is a common fusion point where there are behavioral changes at different intervals (Budiantara, 2006). Therefore, to obtain the optimal spline should be selected the optimal knot point. If the optimal knot point is obtained, it will give the best spline. One of the optimal knot selection methods is Generalized Cross Validation or GCV (Budiantara,

2000). The corresponding spline model corresponding to the optimal knot point is obtained

Based on Table 1, the best knot for spline model in modelling JCI is linear with three knot. In 2 orde for three knot as well as 1 orde three knot. For 3 orde, it has simililar GCV for all of knots. So the best estimation spline regression model for JCI in one orde for three knots as follow as:

yi 5229.9 3.39ti 7.042 ti 56 8.04(ti 114)

13.5 ti 114

JCI

6000

With R2=93.34% and MSE=10944.73, the graph of it is can be shown as in figure 2.

If we would like to compare with anothe degree, such as 2 orde or 3 orde with the same knots as well as one orde can be done.

JCI

5000

5500

6000

6500

Then we compare model[156] with others model with same[157] knots but different orde.

Then the model spline for cubic with three knots as follow[158] as:

y 5043.82 25.863t 0.572t 2 0.0037t3

i i i i[159,160,161,162,163,164]

i i i

5500

6500

0.0038t 56 5.8105 (t 114) 0.00087 t 114

5000

0 100 200 300 400 500

time

Figure 4. Scatterplot of model spline quadratic with three knots

R-square of spline model cubic with three knots is

89.58 with MSE model 17133.

Based on spline model, the best model for

modelling JCI is spline linearwith three knots.

Somde of model such as quadratic and cubic with

0

100

200

300

400

500

three knots, for same knots with linear, it shows

time

Figure 2. Scatterplot of model spline linaer with three knots

The model of JCI spline quadratic with three knots is follow as:

y 5086.23 17.57t 0.224t 2 0.32 t 56

i i i i

0.0998(ti 114) 0.167 ti 114

JCI

5500

6000

6500

R-square of this model is 90.64 with MSE model is

15393.6. The scatter plot of this model follow as:

5000

0 100 200 300 400 500 time

Figure 3. Scatterplot of model spline quadratic with three knots

that the models have similiarity[185] results as R square.

References:

1. Eubank, R.L., Huang, C., Maldonado, Y.M.,

Wang, N., Wang, S., and Buchanan, R.J. (2004). Smoothing Spline Estimation in Varying-Coefficient Models, J. R. Statist. Soc., 66, Part 3, pp. 653-667.

2. Hu, Z., Wang, N., dan Carroll, R.J. (2004).

Profile Kernel Versus Backfitting In The Partially Linier[186] Models For Longitudinal Or Clustered Data, Biometrika, Vol. 91, No. 2, hal.[187] 251-262.

3. Huang, J.Z. (2003). Asymptotics for Polynomial Spline Regression under Weak Conditions, Statistics and Probability Letters,

65: 207-216.

4. Ibrahim, N.A. dan Suliadi. (2008). Analyzing Longitudinal Data Using Gee – Smoothing Spline, Proceedings of the 8th WSEAS International Conference on Applied Computer and Applied Computational science,[188] hal.[189] 26-33.

5. Lin, X., Wang, N., Wels, A.H., Carroll, R.J. (2004). Equivalent Kernels Of Smoothing Splines In Nonparametrics Regression For

International Seminar on Education and Development of

Asia

1st INseIDEA[190] Saturday, July 14th, 2018

ISBN: 978-602-5614-24-8

Clustered/Longitudinal Data. Biometrika, Vol.
91, No. 1, hal.[191] 177-193.

6. Takezawa, K. (2006). Introduction to[192] Nonparametric Regression. New Jersey: John Wiley & Sons,Inc.[193]

7. Wu, H. dan Zhang, J.T. (2006). Nonparametric Regression Methods for Longitudinal Data Analysis. A John-Wiley and Sons Inc. Publication, New Jersey.

1.	~~INselDEA~~ → inside	Misspelled Words	Correctness
2.	~~MODELLING~~ → Modeling	Mixed Dialects of English	Correctness
3.	*be done*	Passive Voice Misuse	Clarity
4.	a parametric	Determiner Use (a/an/the/this, etc.)	Correctness
5.	~~the~~ spline	Determiner Use (a/an/the/this, etc.)	Correctness
6.	*Regression analysis can be done by parametric and nonparametric approach. The nonparametric approach does not assume an assumption compared to parametric. One nonparametric approach is the spline truncated.*	Monotonous Sentences	Engagement
7.	The spline, or A spline	Determiner Use (a/an/the/this, etc.)	Correctness
8.	Cross-Validation	Misspelled Words	Correctness
9.	~~In this~~ → This	Wrong or Missing Prepositions	Correctness
10.	the Jakarta	Determiner Use (a/an/the/this, etc.)	Correctness
11.	exchange in	Wrong or Missing Prepositions	Correctness
12.	study,	Punctuation in Compound/Complex Sentences	Correctness
13.	~~Regression is~~ → Regression is	Improper Formatting	Correctness
14.	~~is one~~ → is one	Improper Formatting	Correctness
15.	~~one of~~ → one of	Improper Formatting	Correctness
16.	~~of the~~ → of the	Improper Formatting	Correctness

17.	the statistical	Improper Formatting	Correctness
18.	statistical methods	Improper Formatting	Correctness
19.	~~methods to~~ → methods to	Improper Formatting	Correctness
20.	easy,	Comma Misuse within Clauses	Correctness
21.	the parametric	Determiner Use (a/an/the/this, etc.)	Correctness
22.	the nonparametric	Determiner Use (a/an/the/this, etc.)	Correctness
23.	the explanatory	Determiner Use (a/an/the/this, etc.)	Correctness
24.	the unrecognized	Determiner Use (a/an/the/this, etc.)	Correctness
25.	the regression	Determiner Use (a/an/the/this, etc.)	Correctness
26.	~~yi~~ → I, Yi	Misspelled Words	Correctness
27.	*is done*	Passive Voice Misuse	Clarity
28.	~~yi~~ → you, Yi	Misspelled Words	Correctness
29.	the response	Determiner Use (a/an/the/this, etc.)	Correctness
30.	a curve, or the curve	Determiner Use (a/an/the/this, etc.)	Correctness
31.	the data	Determiner Use (a/an/the/this, etc.)	Correctness
32.	~~prediktor~~ → predictor	Misspelled Words	Correctness
33.	*is prediktor variable and i is*	Incomplete Sentences	Correctness

34.	the approach	Determiner Use (a/an/the/this, etc.)	Correctness
35.	*be done*	Passive Voice Misuse	Clarity
36.	~~done~~ → made	Incorrect Phrasing	Correctness
37.	Some nonparametric	Improper Formatting	Correctness
38.	nonparametric regression	Improper Formatting	Correctness
39.	, and	Comma Misuse within Clauses	Correctness
40.	~~the spline~~ → the spline	Improper Formatting	Correctness
41.	~~and selecting~~ → and selecting	Improper Formatting	Correctness
42.	~~the optimum~~ → the optimum	Improper Formatting	Correctness
43.	~~residual~~ → Residual	Improper Formatting	Correctness
44.	the model, or a model	Determiner Use (a/an/the/this, etc.)	Correctness
45.	The spline, or A spline	Determiner Use (a/an/the/this, etc.)	Correctness
46.	general,	Comma Misuse within Clauses	Correctness
47.	*be written*	Passive Voice Misuse	Clarity
48.	the form	Determiner Use (a/an/the/this, etc.)	Correctness
49.	~~K m~~ → Km	Confused Words	Correctness
50.	~~k k~~ → kk	Confused Words	Correctness
51.	~~high~~ → High	Improper Formatting	Correctness
52.	~~modeled~~ → Modeled	Improper Formatting	Correctness

53.	the parameter, or a parameter	Determiner Use (a/an/the/this, etc.)	Correctness
54.	K1-,	Improper Formatting	Correctness
55.	K2-,	Improper Formatting	Correctness
56.	,,	Comma Misuse within Clauses	Correctness
57.	*are knot.*	Incomplete Sentences	Correctness
58.	~~If~~ → I	Confused Words	Correctness
59.	a knot	Determiner Use (a/an/the/this, etc.)	Correctness
60.	~~knot~~ → knots	Incorrect Noun Number	Correctness
61.	~~from the~~ → from the	Improper Formatting	Correctness
62.	the smallest	Improper Formatting	Correctness
63.	*is defined*	Passive Voice Misuse	Clarity
64.	~~K M~~ → KM	Confused Words	Correctness
65.	K1-,	Improper Formatting	Correctness
66.	K2-,	Improper Formatting	Correctness
67.	1-,	Improper Formatting	Correctness
68.	2-,	Improper Formatting	Correctness
69.	~~K M~~ → KM	Confused Words	Correctness
70.	~~K M~~ → KM	Confused Words	Correctness

71.	*be written*	Passive Voice Misuse	Clarity
72.	K-,	Improper Formatting	Correctness
73.	K-,	Improper Formatting	Correctness
74.	K-,	Improper Formatting	Correctness
75.	K1-,	Improper Formatting	Correctness
76.	K2-,	Improper Formatting	Correctness
77.	The spline	Determiner Use (a/an/the/this, etc.)	Correctness
78.	*be written*	Passive Voice Misuse	Clarity
79.	the equation	Determiner Use (a/an/the/this, etc.)	Correctness
80.	~~i~~ → I	Misspelled Words	Correctness
81.	~~i~~ → I	Misspelled Words	Correctness
82.	K1,	Punctuation in Compound/Complex Sentences	Correctness
83.	~~,,~~ → ,, .	Comma Misuse within Clauses	Correctness
84.	*yi*	Unknown Words	Correctness
85.	*is written*	Passive Voice Misuse	Clarity
86.	a matrix	Determiner Use (a/an/the/this, etc.)	Correctness

87.	~~be follow~~ → be followed, be following	Incorrect Verb Forms	Correctness
88.	~~m m~~ → mm	Confused Words	Correctness
89.	12th,	Comma Misuse within Clauses	Correctness
90.	~~mean~~ → meant	Incorrect Verb Forms	Correctness
91.	the variance	Determiner Use (a/an/the/this, etc.)	Correctness
92.	the minimum	Determiner Use (a/an/the/this, etc.)	Correctness
93.	, and	Punctuation in Compound/Complex Sentences	Correctness
94.	the maximum	Determiner Use (a/an/the/this, etc.)	Correctness
95.	~~as follow~~ → as follow	Improper Formatting	Correctness
96.	~~follow~~ → follows	Faulty Subject-Verb Agreement	Correctness
97.	~~as in~~ → as in	Improper Formatting	Correctness
98.	~~plot~~ → parcel, scheme	Word Choice	Engagement
99.	~~m m~~ → mm	Confused Words	Correctness
100.	*tn*	Unknown Words	Correctness
101.	*tn*	Unknown Words	Correctness
102.	~~tn~~ → in	Misspelled Words	Correctness
103.	*tn*	Unknown Words	Correctness
104.	~~arround~~ → around	Misspelled Words	Correctness

105.	K1-,	Improper Formatting	Correctness
106.	~~m m~~ → mm	Confused Words	Correctness
107.	*tn*	Unknown Words	Correctness
108.	*tn*	Unknown Words	Correctness
109.	~~tn~~ → in	Misspelled Words	Correctness
110.	~~First~~ → The first	Determiner Use (a/an/the/this, etc.)	Correctness
111.	~~modelling~~ → modeling	Mixed Dialects of English	Correctness
112.	~~is determine~~ → determines	Incorrect Verb Forms	Correctness
113.	to determine	Incorrect Verb Forms	Correctness
114.	~~determine~~ → learn	Word Choice	Engagement
115.	~~used~~ → use	Modal Verbs	Correctness
116.	~~, it~~ → ; it, , and it, . It	Punctuation in Compound/Complex Sentences	Correctness
117.	~~optimum~~ → excellent	Word Choice	Engagement
118.	up to	Wrong or Missing Prepositions	Correctness
119.	the spline, or a spline	Determiner Use (a/an/the/this, etc.)	Correctness
120.	~~, then~~ → ; then, , and then, . Then	Punctuation in Compound/Complex Sentences	Correctness
121.	the spline	Determiner Use (a/an/the/this, etc.)	Correctness
122.	~~K M~~ → KM	Confused Words	Correctness

123.	K1-,	Improper Formatting	Correctness
124.	2-,	Improper Formatting	Correctness
125.	~~important~~ → significant	Word Choice	Engagement
126.	~~common~~ → conventional, joint	Word Choice	Engagement
127.	as the	Wrong or Missing Prepositions	Correctness
128.	~~point is~~ → point is	Improper Formatting	Correctness
129.	~~is obtained~~ → is obtained	Improper Formatting	Correctness
130.	*is obtained*	Passive Voice Misuse	Clarity
131.	~~obtained~~ → received	Word Choice	Engagement
132.	~~it will~~ → it will	Improper Formatting	Correctness
133.	~~will give~~ → will give	Improper Formatting	Correctness
134.	~~give the~~ → give the	Improper Formatting	Correctness
135.	~~the best~~ → the best	Improper Formatting	Correctness
136.	~~best spline~~ → best spline	Improper Formatting	Correctness
137.	Cross-Validation	Misspelled Words	Correctness
138.	*is obtained*	Passive Voice Misuse	Clarity
139.	the spline	Determiner Use (a/an/the/this, etc.)	Correctness
140.	~~modelling~~ → modeling	Mixed Dialects of English	Correctness
141.	~~knot~~ → knots	Incorrect Noun Number	Correctness
142.	~~knot~~ → knots	Incorrect Noun Number	Correctness

143.	~~1~~ → one	Improper Formatting	Correctness
144.	~~knot~~ → knots	Incorrect Noun Number	Correctness
145.	~~3~~ → three	Improper Formatting	Correctness
146.	~~simililar~~ → similar	Misspelled Words	Correctness
147.	the knots	Determiner Use (a/an/the/this, etc.)	Correctness
148.	~~yi~~ → Yi	Misspelled Words	Correctness
149.	~~ti~~ → to	Confused Words	Correctness
150.	~~is~~	Redundant Words	Correctness
151.	*be shown*	Passive Voice Misuse	Clarity
152.	it with	Pronoun Use	Correctness
153.	~~anothe~~ → another	Misspelled Words	Correctness
154.	~~2~~ → two	Improper Formatting	Correctness
155.	~~3~~ → three	Improper Formatting	Correctness
156.	the model, or a model	Determiner Use (a/an/the/this, etc.)	Correctness
157.	the same	Determiner Use (a/an/the/this, etc.)	Correctness
158.	~~follow~~ → follows	Faulty Subject-Verb Agreement	Correctness
159.	I i	Misspelled Words	Correctness
160.	*i i i*	Pronoun Use	Correctness

161.	i I i	Misspelled Words	Correctness
162.	*i i i*	Pronoun Use	Correctness
163.	i I i	Misspelled Words	Correctness
164.	*i i*	Pronoun Use	Correctness
165.	the spline	Determiner Use (a/an/the/this, etc.)	Correctness
166.	~~modelling~~ → Modelling	Improper Formatting	Correctness
167.	~~modelling~~ → modeling	Mixed Dialects of English	Correctness
168.	~~is spline~~ → is spline	Improper Formatting	Correctness
169.	spline linearwith	Improper Formatting	Correctness
170.	~~linearwith~~ → linear with	Misspelled Words	Correctness
171.	linearwith three	Improper Formatting	Correctness
172.	~~three knots~~ → three knots	Improper Formatting	Correctness
173.	~~Somde~~ → Some	Misspelled Words	Correctness
174.	the model, or a model	Determiner Use (a/an/the/this, etc.)	Correctness
175.	~~linaer~~ → linear, liner	Misspelled Words	Correctness
176.	~~is follow~~ → is followed	Incorrect Verb Forms	Correctness
177.	I i	Misspelled Words	Correctness
178.	*i i i*	Pronoun Use	Correctness
179.	i I i	Misspelled Words	Correctness
180.	*i i i*	Pronoun Use	Correctness

181.	i I i	Misspelled Words	Correctness
182.	*i i*	Pronoun Use	Correctness
183.	~~ti~~ → to	Confused Words	Correctness
184.	~~follow~~ → follows	Faulty Subject-Verb Agreement	Correctness
185.	~~similiarity~~ → similarity	Misspelled Words	Correctness
186.	~~Linier~~ → Linear	Misspelled Words	Correctness
187.	*hal*	Unknown Words	Correctness
188.	~~science~~ → Science	Misspelled Words	Correctness
189.	*hal*	Unknown Words	Correctness
190.	~~INselDEA~~ → inside	Misspelled Words	Correctness
191.	*hal*	Unknown Words	Correctness
192.	Introduction to	Improper Formatting	Correctness
193.	, Inc	Improper Formatting	Correctness