



CANADA'S
FOOD PRICE REPORT
2017
SUPPLEMENTAL REPORT



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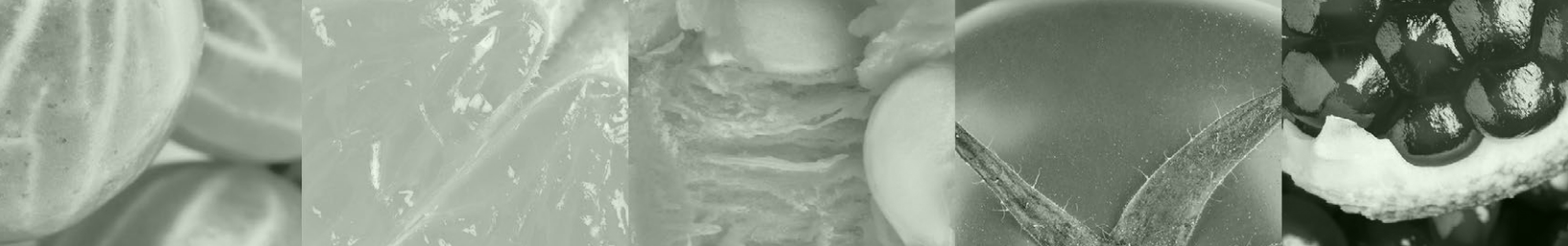
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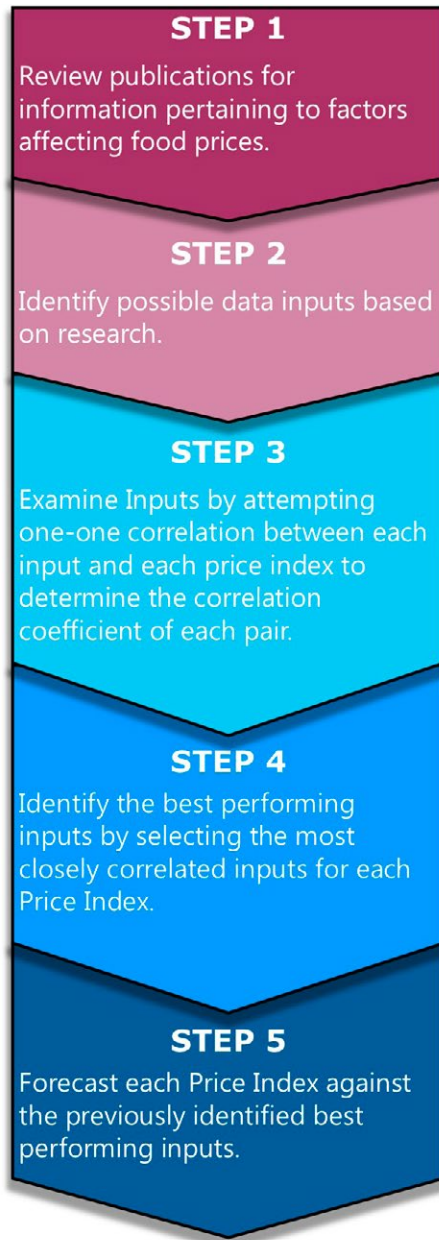
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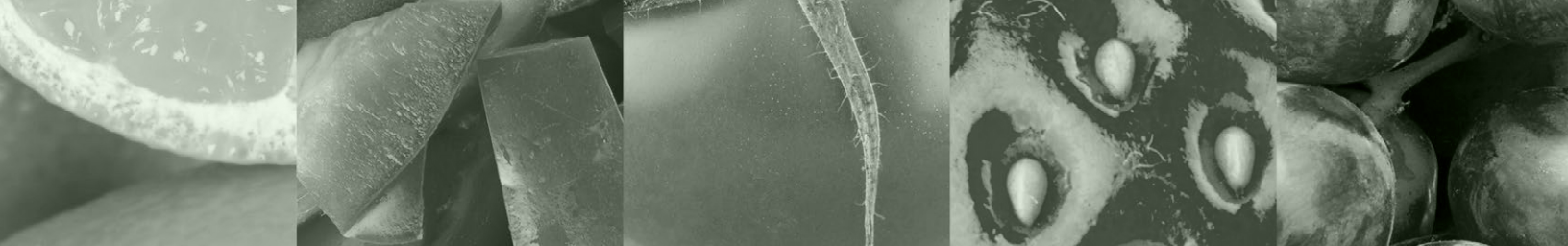
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METHODOLOGY

Figure 1: Procedures for Food Price Index Predictions with Machine Learning





Step 1: Research Publications for information pertaining to factors affecting food prices

To gain a better understanding of the factors affecting the prices of food, a substantial amount of time was initially dedicated to reviewing recent food-related news articles and publications from respected international organizations including the World Bank, United Nations, Food and Agriculture Organization and the International Monetary Fund. This review produced three broad categories of factors affecting the price of food, Demand, Supply and Distribution.

Step 2: Identify possible data inputs

From these three categories we were able to identify 20 distinct inputs, which are described on page 8 of this document and with more detail in the “*Input Data Sources*” worksheet of the “*Food Price Report 2017 – Summary*” Microsoft Excel workbook. To be considered, a potential input must have had a minimum of 15 years of reliable data found between 1999 and 2015 and must have been available from a reputable data source. Exceptions were made for some inputs for which recent data had not yet be reported. A particular exception was made for Gasoline and Diesel prices which were only recorded bi-annually and as a result contained only 8 years of data.

Step 3: Examine Inputs by performing one-one correlation between each input and each price index to determine the correlation coefficient of each pair.

With the 20 distinct inputs selected, the task then switched from data collection to preliminary testing. Each input was subjected to a range of tests to determine how well it correlated with each food price index. To do this an input was paired with a particular price index and evaluated against 5 trusted algorithms. These algorithms each represented a different machine learning category:

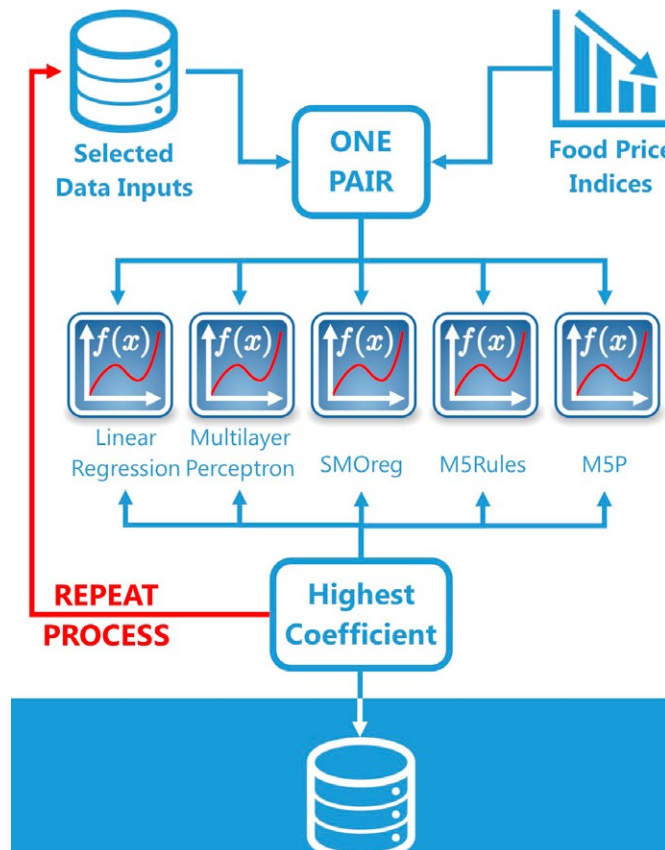
Category	Algorithm
Multivariable Linear Regression	Linear Regression
Neural Networka	MultilayerPerceptron
Support Vector Machine	SMOreg
Decision Rules	M5Rules
Decision Tree	M5P



Each algorithm produced a correlation coefficient for the pair and the highest coefficient was recorded for the pair. The process then repeated for another pair of input and price index until all permutations of the pairing process had been evaluated by each of the five machine learning algorithms. The results of these pairings are documented in detail in the “Preliminary Investigation” worksheet of the “Food Price Report 2017 – Summary” Microsoft Excel workbook and the workflow is also visualized in *figure 2* below.

The machine learning techniques employed in this project differ conceptually from statistical techniques in that statistics represents a subfield of mathematics, which is concerned with finding relationships and testing hypotheses, while machine learning is a subset of computer science and artificial intelligence, which build systems that can formulate the process of generalization through autonomous learning as they analyze enormous archives of data (Witten, Frank, & Hall, 2011) (Schabenberger, 2016).

Figure 2: Workflow of procedures used to determine the best performing inputs





Step 4: Identify the best performing inputs by selecting the most closely correlated inputs for each Price Index.

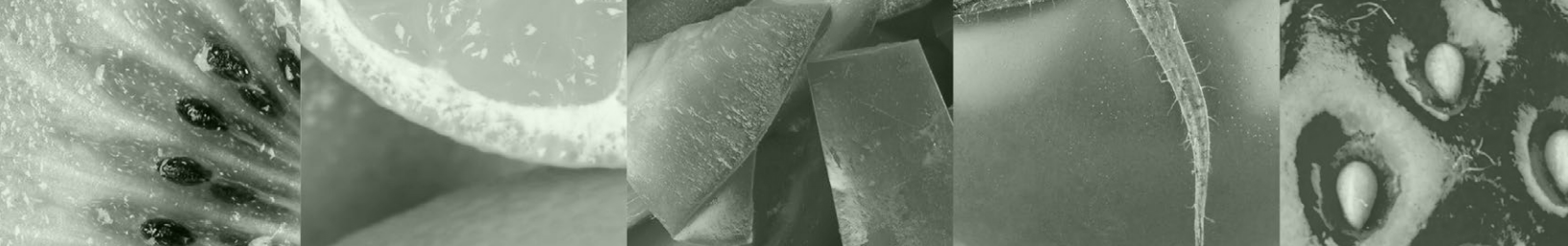
The best performing inputs are simply those which achieved an above average correlation coefficient per price index. Each index correlated with a variety of inputs and these became the dataset for forecasting the 2016 and 2017 price indexes.

Step 5: Forecast each Price Index against the previously identified best performing inputs.

The final step in the process was simple from a usability point of view, however the complexity of the algorithms utilized makes it very difficult to provide a detailed explanation of the operations performed. Generally, the algorithm would have transformed the data into a format more suitable for its requirements, in most cases the data was at least normalized but there may have been other operations applied as well. Next the algorithm analyzes the data by examining each line and learning what it can through complex comparisons and dozens, if not hundreds, of permutations. This a complicated process, often much too difficult for the human mind to comprehend but algorithms can operate much faster and with much more accuracy than humans and are so able to complete the function in relatively short periods of time.

Finally, after having examined the data and learned what it could, the algorithm then attempts to make predictions for the price index values it already knows. After several rounds of predictions, the algorithm outputs its best prediction, along with the predictions it made for the price index values it already knew and the absolute mean error at each stage of the of the entire operation. The output dialogue from the machine learning algorithm data can be found below in the Weka Results Output section and the output has been further summarized in the “*Prediction Evaluation*” and “*Prediction Details*” worksheets of the “*Food Price Report 2017 – Summary*” Microsoft Excel workbook.

Due exclusively to the speed and efficiency of the machine learning software, Weka 3.8.0, it was possible to again use all five algorithms to determine the best prediction. To accomplish this the output value from each algorithm for the 2016 prediction was compared to the 2016 average price index to date. The algorithm which best represented the 2016 trend of the price indices was chosen. This is why the Bakery and Cereal prediction was calculated with the Linear Regression algorithm, while all the other predictions found success with the SMOreg algorithm. The details of how well each algorithm performed can be found in the “*Prediction Details*” worksheet of the “*Food Price Report 2017 – Summary*” Microsoft Excel workbook.



At the end, again due to WEKA's speedy processing, there was time available to incorporate market futures data into the analysis. Instead first determining if the market futures data had a high correlation coefficient like the other inputs in the dataset, the goal was simply to determine if futures data made any significant changes to the results that had already been obtained during the conventional analysis. In this regard, market futures were added as yet another input and each price index was once again predicted. The details of comparison between the conventional predictions and the futures based predictions can be found in the “*Prediction Evaluation*” worksheet of the “*Food Price Report 2017 – Summary*” Microsoft Excel workbook.

Table 1: Data Input Description (More details available in “*Food Price Report 2017 – Summary*” the workbook)

Input	Unit	Measured	Duration	Monthly
Canada Deposable Income	CAD/Household	x 1,000,000	1999–2016	Annually
Canada Household Farm Income	CAD/Household	x 1,000,000	1999–2016	Annually
Canada Household Income	CAD/Household	x 1,000,000	1999–2016	Annually
Canada Household Net Saving	CAD/Household	x 1,000,000	1999–2016	Annually
Canada Net Lending or Borrowing	CAD/Household	x 1,000,000	1999–2016	Annually
Canada Immigrants with Income	Persons (SUM)		1997–2013	Annually
Canada Immigrant Mean Income	CAD (SUM)		1997–2013	Annually
Canada Income Distribution	Persons (SUM)		2000–2014	Annually
International Aid Dollars	Tons (SUM)		1999–2015	Annually
Population	Persons (SUM)		1999–2015	Annually
Unemployment Rate	Rate		2000–2015	Annually
FAO Commodity Index	Rate		1999–2015	Annually
Commodity Futures	Average Closing Price		2001–2015	Annually
Commodity Market Food Price	USD/Kg		1999–2015	Annually
Gasoline Prices	Pump Price (USD/l)		1999–2014	Bi-Annual
Diesel Prices	Pump Price (USD/l)		1999–2014	Bi-Annual
Crude Oil Prices	Average(USD/Barrel)		1999–2015	Annually
Canada Consumer Price Index Energy	Rate (SUM & Average)		1999–2015	Annually
Potash Import Value	USD (SUM)	x 1,000	1999–2014	Annually
Global Agricultural Production	USD (SUM)		1999–2013	Annually
US Overnight Lending Rates	Rate (SUM)		2000–2015	Monthly
CAD vs USD	Rate (Average)		1999–2015	Annually
US Credit to Agriculture	USD (SUM)	x1,000,000	1998–2014	Annually
Precipitation	Inches (Anomaly)		1999–2015	Annually
Temperature	Fahrenheit (Average)		1999–2015	Annually



Table 2: Canada Food Price Indices

	Restaurants	Dairy products and Eggs	Fruit, and Nuts	Other	Bakery and Cereal	Meat	Vegetables	Fish & Seafood
1999	92	92.4	93.8	97	94.7	86.7	86.9	95.3
2000	94	93.9	90.8	97.3	94.4	90.8	88	96
2001	96.9	97.1	97.2	99	97.3	98.6	93.3	99.5
2002	100	100	100	100	100	100	100	100
2003	102.5	103.1	98.2	103.3	104.3	101.8	94.3	99.7
2004	105.2	105.7	99.3	104.4	107	106.2	92.1	99.1
2005	108.2	111	98.8	107	109.8	108.2	93.6	99.1
2006	111.1	115.5	101.3	108.9	113.6	107.9	98.4	98
2007	114.1	119.8	105.7	110.1	118.1	111.1	98.6	100.1
2008	117	124.5	107.4	112.8	132.4	113.4	100.6	101.2
2009	121.1	128.9	113.1	120.5	137.9	118.4	110.2	108.6
2010	124	130.2	112	124.1	138.8	119.1	109.3	108.7
2011	127.5	134	115.9	128.2	146	125.4	117.1	109
2012	130.6	135.9	119.5	131	150.4	132	113.3	111.8
2013	132.6	135.8	122.3	129.9	152.2	134.8	117.4	114.3
2014	135.2	135.5	125.8	129.8	151.4	145.6	122.5	123.4
2015	138.9	136.8	132.4	133.7	154.6	156.6	130.8	125.4
Jan-2016	141	136.7	144.9	134.8	156.6	156.9	150.7	127.7
Feb-2016	141.4	137.8	145.7	135.6	156.2	156.8	150.9	127.3
Mar-2016	141.4	136.8	141.7	135.9	155.6	160	146.6	127.4
Apr-2016	141.8	136.7	138.2	136.4	156.4	158.7	140.7	129.6
May-2016	142.1	136.6	137.6	136	156.6	159.1	134.5	130.6
Jun-2016	142.3	135.5	137.4	135.2	155.2	156.7	135.8	131.9
Jul-2016	142.7	135.8	135.9	135.8	155.4	158.4	135.2	132.9
Aug-2016	142.9	136.7	130.9	136.1	155.3	157.5	129.4	132.8
Sep-2016	143.1	134.6	129.7	133.3	151.5	156.7	122.9	132



WEKA OUTPUT DETAILS

Consumer Price Index: Meat

=== Run information ===

Scheme:

SMOreg -C 1.0 -N 0 -I "RegSMOImproved -T 0.001 -V -P 1.0E-12 -L 0.001 -W 1" -K "PolyKernel -E 1.0 -C 250007"

Lagged and derived variable options:

-F "CANADA Consumer Price Index Meat (Annual Average)" -L 1 -M 5

Relation:

Dataset TEST-weka.filters.unsupervised.attribute.Remove-R1,7-32,70,77,79-81,83,85,106-113-weka.filters.unsupervised.attribute.Remove-R73-79

Instances: 17

Attributes: 72

Farm Income	Commodity Price Rice Thai 25Percent
Primary Household Income	Commodity Price Rice Thai A1
Household Disposable Income	Commodity Price Wheat Us Srw
Household Net Saving	Commodity Price Wheat Us Hrw
Net Lending Or Net Borrowing	Commodity Price Banana Europe
Commodity Price Banana US	Global Aid
Commodity Price Orange	Population Africa
Commodity Price Beef	Population Americas
Commodity Price Meat Chicken	Population Asia
Commodity Price Meat Sheep	Population Europe
Commodity Price Shrimps Mexican	Population Oceania
Commodity Price Sugar EU	CANADA Consumer Price Index Energy
Commodity Price Sugar US	Temperature
Commodity Price Sugar World	Us Credit To Agriculture
Commodity Price Woodpulp	Futures Soybeans cbot
Commodity Price Cotton A	Futures Soybean Meal cbot
Commodity Price Cocoa	Futures Soybean Oil cbot
Commodity Price Coffee Arabica	Futures Canola wce
Commodity Price Coffee Robusta	Futures Corn cbot
Commodity Price Tea Avg 3 Auctions	Futures Wheat cbot
Commodity Price Tea Colombo	Futures Wheat kcbt
Commodity Price Tea Kolkata	Futures Wheat mge
Commodity Price Tea Mombasa	Futures Oats cbot
Commodity Price Coconut Oil	Futures Rough Rice cbot
Commodity Price Copra	Futures Live Cattle cme
Commodity Price Groundnuts	Futures Feeder Cattle cme
Commodity Price Fish Meal	Futures Lean Hogs cme
Commodity Price Groundnut Oil	Futures Class Iii Milk cme
Commodity Price Palm Oil	Futures Cocoa ice
Commodity Price Palm Kernel Oil	Futures Coffee C ice
Commodity Price Soybeans	Futures Orange Juice ice
Commodity Price Soybean Oil	Futures Sugar 11 Ice
Commodity Price Soybean Meal	Futures London Cocoa lce
Commodity Price Barley	Futures London Sugar lce
Commodity Price Maize	CANADA Consumer Price Index Meat (Annual
Commodity Price Sorghum	Average)
Commodity Price Rice Thai 5Percent	



Transformed training data:

CANADA Consumer Price Index Meat (Annual Average)
ArtificialTimeIndex
Lag_CANADA Consumer Price Index Meat (Annual Average)-1
Lag_CANADA Consumer Price Index Meat (Annual Average)-2
Lag_CANADA Consumer Price Index Meat (Annual Average)-3
Lag_CANADA Consumer Price Index Meat (Annual Average)-4
Lag_CANADA Consumer Price Index Meat (Annual Average)-5
ArtificialTimeIndex^2
ArtificialTimeIndex^3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-1
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-2
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-4
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-5

CANADA Consumer Price Index Meat (Annual Average):

SM0reg

weights (not support vectors):

+ 0.2772 * (normalized) ArtificialTimeIndex
+ 0.0254 * (normalized) Lag_CANADA Consumer Price Index Meat (Annual Average)-1
- 0.0516 * (normalized) Lag_CANADA Consumer Price Index Meat (Annual Average)-2
+ 0.0468 * (normalized) Lag_CANADA Consumer Price Index Meat (Annual Average)-3
- 0.024 * (normalized) Lag_CANADA Consumer Price Index Meat (Annual Average)-4
- 0.1019 * (normalized) Lag_CANADA Consumer Price Index Meat (Annual Average)-5
+ 0.3197 * (normalized) ArtificialTimeIndex^2
+ 0.4763 * (normalized) ArtificialTimeIndex^3
- 0.0788 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-1
- 0.1369 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-2
- 0.0587 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-3
+ 0.0016 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-4
+ 0.0498 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Meat (Annual Average)-5
+ 0.1743

Number of kernel evaluations: 153 (97.811% cached)



=== Predictions for training data: CANADA Consumer Price Index Meat (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
7	108.2	107.2168	104.617:112.836	-0.9832
8	107.9	107.9895	105.39:113.609	0.0895
9	111.1	110.8967	108.297:116.516	-0.2033
10	113.4	114.2734	111.674:119.893	0.8734
11	118.4	117.2447	114.645:122.864	-1.1553
12	119.1	121.6323	119.033:127.252	2.5323
13	125.4	126.5017	123.902:132.121	1.1017
14	132	132.0755	129.476:137.695	0.0755
15	134.8	137.3994	134.8:143.019	2.5994
16	145.6	143.2659	140.667:148.885	-2.3341
17	156.6	150.9807	148.381:156.6	-5.6193
18	?	157.0248	154.425:162.644	?

=== Future predictions from end of training data ===

inst#	CANADA Consumer Price Index Meat (Annual Average)
1	86.7
2	90.8
3	98.6
4	100
5	101.8
6	106.2
7	108.2
8	107.9
9	111.1
10	113.4
11	118.4
12	119.1
13	125.4
14	132
15	134.8
16	145.6
17	156.6
18*	156.9518
19*	164.1838



=== Evaluation on training data ===

Target	1-step-ahead	2-steps-ahead
CANADA Consumer Price Index Meat (Annual Average)		
N	12	11
Mean absolute error	1.4758	1.597
Root mean squared error	2.1359	2.2264
Total number of instances: 17		



Consumer Price Index: Fish, Seafood and Other Marine Products

=== Run information ===

Scheme:

SM0reg -C 1.0 -N 0 -I "RegSM0Improved -T 0.001 -V -P 1.0E-12 -L 0.001 -W 1" -K
"PolyKernel -E 1.0 -C 250007"

Lagged and derived variable options:

-F "CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual
Average)" -L 1 -M 5

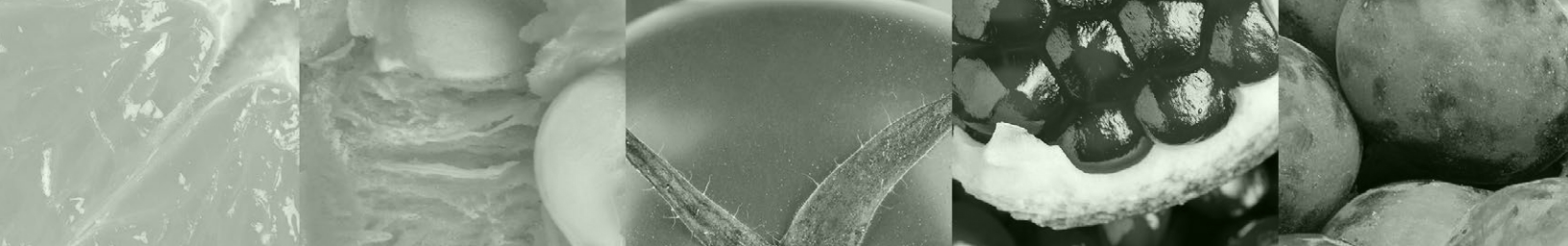
Relation:

Dataset TEST-weka.filters.unsupervised.attribute.
Remove-R1,7-32,70,77-81,83-85,106-114,116-121

Instances: 17

Attributes: 70

Farm Income	Commodity Price Rice Thai 5Percent
Primary Household Income	Commodity Price Rice Thai 25Percent
Household Disposable Income	Commodity Price Rice Thai A1
Household Net Saving	Commodity Price Wheat Us Srw
Net Lending Or Net Borrowing	Commodity Price Wheat Us Hrw
Commodity Price Banana US	Commodity Price Banana Europe
Commodity Price Orange	Global Aid
Commodity Price Beef	Population Africa
Commodity Price Meat Chicken	Population Americas
Commodity Price Meat Sheep	Population Asia
Commodity Price Shrimps Mexican	Population Europe
Commodity Price Sugar EU	Population Oceania
Commodity Price Sugar US	Temperature
Commodity Price Sugar World	Futures Soybeans cbot
Commodity Price Woodpulp	Futures Soybean Meal cbot
Commodity Price Cotton A	Futures Soybean Oil cbot
Commodity Price Cocoa	Futures Canola wce
Commodity Price Coffee Arabica	Futures Corn cbot
Commodity Price Coffee Robusta	Futures Wheat cbot
Commodity Price Tea Avg 3 Auctions	Futures Wheat kcbt
Commodity Price Tea Colombo	Futures Wheat mge
Commodity Price Tea Kolkata	Futures Oats cbot
Commodity Price Tea Mombasa	Futures Rough Rice cbot
Commodity Price Coconut Oil	Futures Live Cattle cme
Commodity Price Copra	Futures Feeder Cattle cme
Commodity Price Groundnuts	Futures Lean Hogs cme
Commodity Price Fish Meal	Futures Class Iii Milk cme
Commodity Price Groundnut Oil	Futures Cocoa ice
Commodity Price Palm Oil	Futures Coffee C ice
Commodity Price Palm Kernel Oil	Futures Orange Juice ice
Commodity Price Soybeans	Futures Sugar 11 Ice
Commodity Price Soybean Oil	Futures London Cocoa lce
Commodity Price Soybean Meal	Futures London Sugar lce
Commodity Price Barley	CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)
Commodity Price Maize	
Commodity Price Sorghum	



Transformed training data:

CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)
ArtificialTimeIndex
Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-1
Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-2
Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-3
Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-4
Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-5
ArtificialTimeIndex^2
ArtificialTimeIndex^3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-1
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-2
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-4
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-5

CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average):
SMOreg

weights (not support vectors):

+ 0.2237 * (normalized) ArtificialTimeIndex
+ 0.291 * (normalized) Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-1
- 0.0086 * (normalized) Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-2
- 0.0017 * (normalized) Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-3
- 0.0716 * (normalized) Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-4
+ 0.1833 * (normalized) Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-5
+ 0.2594 * (normalized) ArtificialTimeIndex^2
+ 0.3521 * (normalized) ArtificialTimeIndex^3
- 0.17 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-1
- 0.2049 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-2
+ 0.0434 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-3
+ 0.1033 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-4
+ 0.0094 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)-5
- 0.0106

Number of kernel evaluations: 153 (97.083% cached)



=== Predictions for training data: CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
7	99.1	97.8199	95.34:101.195	-1.2801
8	98	100.2183	97.739:103.593	2.2183
9	100.1	102.1734	99.694:105.548	2.0734
10	101.2	103.6795	101.2:107.054	2.4795
11	108.6	105.2252	102.746:108.6	-3.3748
12	108.7	107.2762	104.797:110.651	-1.4238
13	109	108.9222	106.443:112.297	-0.0778
14	111.8	111.859	109.38:115.234	0.059
15	114.3	114.3707	111.891:117.746	0.0707
16	123.4	120.3737	117.894:123.749	-3.0263
17	125.4	124.5361	122.057:127.911	-0.8639
18	?	127.9157	125.436:131.291	?

=== Future predictions from end of training data ===

inst#	CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)
1	95.3
2	96
3	99.5
4	100
5	99.7
6	99.1
7	99.1
8	98
9	100.1
10	101.2
11	108.6
12	108.7
13	109
14	111.8
15	114.3
16	123.4
17	125.4
18*	127.93
19*	132.6393



=== Evaluation on training data ===

<u>Target</u>	<u>1-step-ahead</u>	<u>2-steps-ahead</u>
CANADA Consumer Price Index Fish Seafood And Other Marine Products (Annual Average)		
N	12	11
Mean absolute error	1.3008	1.5407
Root mean squared error	1.8236	1.9151
Total number of instances: 17		



Consumer Price Index: Dairy Products and Eggs

=== Run information ===

Scheme:

SMOreg -C 1.0 -N 0 -I "RegSMOImproved -T 0.001 -V -P 1.0E-12 -L 0.001 -W 1" -K "PolyKernel -E 1.0 -C 250007"

Lagged and derived variable options:

-F "CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)" -L 1 -M 8

Relation:

Dataset TEST-weka.filters.unsupervised.attribute.
Remove-R1,23-32,81-82,85,106-115,117-121

Instances: 17

Attributes: 92

Farm Income	Commodity Price Coconut Oil
Primary Household Income	Commodity Price Copra
Household Disposable Income	Commodity Price Groundnuts
Household Net Saving	Commodity Price Fish Meal
Net Lending Or Net Borrowing	Commodity Price Groundnut Oil
Immigrants Mean With Income	Commodity Price Palm Oil
Immigrants Total With Income Persons	Commodity Price Palm Kernel Oil
Total Persons With Income	Commodity Price Soybeans
Persons With Income Under 5000	Commodity Price Soybean Oil
Persons With Income Of 5000 And Over	Commodity Price Soybean Meal
Persons With Income Of 10000 And Over	Commodity Price Barley
Persons With Income Of 15000 And Over	Commodity Price Maize
Persons With Income Of 20000 And Over	Commodity Price Sorghum
Persons With Income Of 25000 And Over	Commodity Price Rice Thai 5Percent
Persons With Income Of 35000 And Over	Commodity Price Rice Thai 25Percent
Persons With Income Of 50000 And Over	Commodity Price Rice Thai A1
Persons With Income Of 75000 And Over	Commodity Price Wheat Us Srw
Persons With Income Of 100000 And Over	Commodity Price Wheat Us Hrw
Persons With Income Of 150000 And Over	Commodity Price Banana Europe
Persons With Income Of 200000 And Over	Fao Food Price Index
Persons With Income Of 250000 And Over	Global Aid
Commodity Price Banana US	Population Africa
Commodity Price Orange	Population Americas
Commodity Price Beef	Population Asia
Commodity Price Meat Chicken	Population Europe
Commodity Price Meat Sheep	Population Oceania
Commodity Price Shrimps Mexican	Crude Oil
Commodity Price Sugar EU	CANADA Consumer Price Index Energy
Commodity Price Sugar US	CAD Vs USD
Commodity Price Sugar World	Agriculture Production
Commodity Price Woodpulp	Potash
Commodity Price Cotton A	Us Credit To Agriculture
Commodity Price Cocoa	Futures Soybeans cbot
Commodity Price Coffee Arabica	Futures Soybean Meal cbot
Commodity Price Coffee Robusta	Futures Soybean Oil cbot
Commodity Price Tea Avg 3 Auctions	Futures Canola wce
Commodity Price Tea Colombo	Futures Corn cbot
Commodity Price Tea Kolkata	Futures Wheat cbot
Commodity Price Tea Mombasa	Futures Wheat kcbt



Futures Wheat mge
 Futures Oats cbot
 Futures Rough Rice cbot
 Futures Live Cattle cme
 Futures Feeder Cattle cme
 Futures Lean Hogs cme
 Futures Class Iii Milk cme
 Futures Cocoa ice
 Futures Coffee C ice
 Futures Orange Juice ice
 Futures Sugar 11 Ice
 Futures London Cocoa lce
 Futures London Sugar lce
 CANADA Consumer Price Index Dairy
 Products And Eggs (Annual Average)

Transformed training data:

CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)
 ArtificialTimeIndex
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-1
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-2
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-3
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-4
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-5
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-6
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-7
 Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-8
 ArtificialTimeIndex^2
 ArtificialTimeIndex^3
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-1
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-2
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-3
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-4
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-5
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-6
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-7
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual
 Average)-8

CANADA Consumer Price Index Dairy Products And Eggs (Annual Average):

SM0reg

weights (not support vectors):

+ 0.5545 * (normalized) ArtificialTimeIndex
 + 0.288 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs
 (Annual Average)-1
 + 0.0664 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs
 (Annual Average)-2
 + 0.0811 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs
 (Annual Average)-3
 + 0.0794 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs
 (Annual Average)-4
 + 0.0406 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs
 (Annual Average)-5
 - 0.051 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs
 (Annual Average)-6
 - 0.0356 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs
 (Annual Average)-7



- 0.12 * (normalized) Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-8
 + 0.2819 * (normalized) ArtificialTimeIndex^2
 + 0.0473 * (normalized) ArtificialTimeIndex^3
 + 0.058 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-1
 - 0.1127 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-2
 - 0.0951 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-3
 - 0.0968 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-4
 - 0.0251 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-5
 - 0.0709 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-6
 - 0.0089 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-7
 - 0.0354 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)-8
 + 0.1577

Number of kernel evaluations: 153 (98.81% cached)

=== Predictions for training data: CANADA Consumer Price Index Dairy Products And Eggs (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
10	124.5	125.1775	124.5:127.5	0.6775
11	128.9	127.3727	126.695:129.696	-1.5273
12	130.2	129.7268	129.049:132.05	-0.4732
13	134	131.8615	131.184:134.184	-2.1385
14	135.9	133.5771	132.9:135.9	-2.3229
15	135.8	134.9711	134.294:137.294	-0.8289
16	135.5	136.1093	135.432:138.432	0.6093
17	136.8	137.0519	136.374:139.375	0.2519
18	?	138.1892	137.512:140.512	?



=== Future predictions from end of training data ===

<u>inst#</u>	<u>CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)</u>
1	92.4
2	93.9
3	97.1
4	100
5	103.1
6	105.7
7	111
8	115.5
9	119.8
10	124.5
11	128.9
12	130.2
13	134
14	135.9
15	135.8
16	135.5
17	136.8
18*	138.1799
19*	139.5226

=== Evaluation on training data ===

<u>Target</u>	<u>1-step-ahead</u>	<u>2-steps-ahead</u>
CANADA Consumer Price Index Dairy Products And Eggs (Annual Average)		
N	9	8
Mean absolute error	0.9355	1.1037
Root mean squared error	1.2497	1.3279

Total number of instances: 17



Consumer Price Index: Bakery and Cereal Products

=== Run information ===

Scheme:

LinearRegression -S 0 -R 1.0E-8 -num-decimal-places 4
 Lagged and derived variable options:
 -F "CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food
 (Annual Average)" -L 1 -M 5

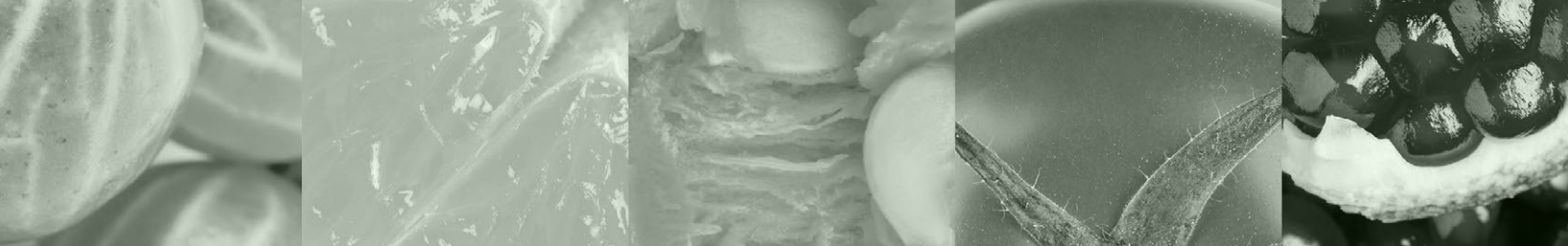
Relation:

Dataset TEST-weka.filters.unsupervised.attribute.
 Remove-R1,23-32,81-82,106-116,118-121

Instances: 17

Attributes: 93

Farm Income	Commodity Price Copra
Primary Household Income	Commodity Price Groundnuts
Household Disposable Income	Commodity Price Fish Meal
Household Net Saving	Commodity Price Groundnut Oil
Net Lending Or Net Borrowing	Commodity Price Palm Oil
Immigrants Mean With Income	Commodity Price Palm Kernel Oil
Immigrants Total With Income Persons	Commodity Price Soybeans
Total Persons With Income	Commodity Price Soybean Oil
Persons With Income Under 5000	Commodity Price Soybean Meal
Persons With Income Of 5000 And Over	Commodity Price Barley
Persons With Income Of 10000 And Over	Commodity Price Maize
Persons With Income Of 15000 And Over	Commodity Price Sorghum
Persons With Income Of 20000 And Over	Commodity Price Rice Thai 5Percent
Persons With Income Of 25000 And Over	Commodity Price Rice Thai 25Percent
Persons With Income Of 35000 And Over	Commodity Price Rice Thai A1
Persons With Income Of 50000 And Over	Commodity Price Wheat Us Srw
Persons With Income Of 75000 And Over	Commodity Price Wheat Us Hrw
Persons With Income Of 100000 And Over	Commodity Price Banana Europe
Persons With Income Of 150000 And Over	Fao Food Price Index
Persons With Income Of 200000 And Over	Global Aid
Persons With Income Of 250000 And Over	Population Africa
Commodity Price Banana US	Population Americas
Commodity Price Orange	Population Asia
Commodity Price Beef	Population Europe
Commodity Price Meat Chicken	Population Oceania
Commodity Price Meat Sheep	Crude Oil
Commodity Price Shrimps Mexican	CANADA Consumer Price Index Energy
Commodity Price Sugar EU	CAD Vs USD
Commodity Price Sugar US	Agriculture Production
Commodity Price Sugar World	Potash
Commodity Price Woodpulp	Us Credit To Agriculture
Commodity Price Cotton A	Us Overnight Lending
Commodity Price Cocoa	Futures Soybeans cbot
Commodity Price Coffee Arabica	Futures Soybean Meal cbot
Commodity Price Coffee Robusta	Futures Soybean Oil cbot
Commodity Price Tea Avg 3 Auctions	Futures Canola wce
Commodity Price Tea Colombo	Futures Corn cbot
Commodity Price Tea Kolkata	Futures Wheat cbot
Commodity Price Tea Mombasa	Futures Wheat kcbt
Commodity Price Coconut Oil	Futures Wheat mge



Futures Oats cbot	Futures Orange Juice ice
Futures Rough Rice cbot	Futures Sugar 11 Ice
Futures Live Cattle cme	Futures London Cocoa lce
Futures Feeder Cattle cme	Futures London Sugar lce
Futures Lean Hogs cme	CANADA Consumer Price Index Bakery And
Futures Class Iii Milk cme	Cereal Products Excluding Baby Food
Futures Cocoa ice	(Annual Average)
Futures Coffee C ice	

Transformed training data:

CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)

ArtificialTimeIndex

Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-1

Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-2

Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-3

Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-4

Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-5

ArtificialTimeIndex^2

ArtificialTimeIndex^3

ArtificialTimeIndex*Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-1

ArtificialTimeIndex*Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-2

ArtificialTimeIndex*Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-3

ArtificialTimeIndex*Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-4

ArtificialTimeIndex*Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-5

CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average):

Linear Regression Model

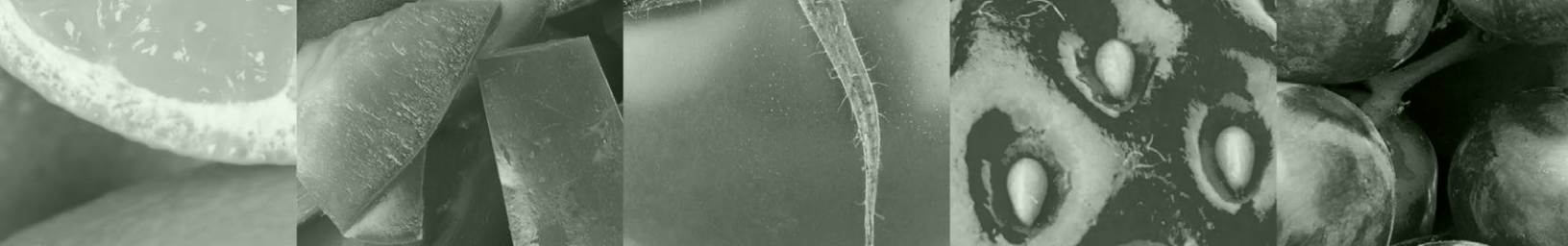
CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average) =

3.632 * ArtificialTimeIndex +

0.9486 * Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-1 +

-0.0202 * ArtificialTimeIndex*Lag_CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)-1 +

0.8241



=== Predictions for training data: CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
7	109.8	114.1426	109.255:120.267	4.3426
8	113.6	118.4877	113.6:124.612	4.8877
9	118.1	122.6597	117.772:128.784	4.5597
10	132.4	127.1711	122.283:133.296	-5.2289
11	137.9	131.7756	126.888:137.9	-6.1244
12	138.8	141.0869	136.199:147.211	2.2869
13	146	145.2705	140.383:151.395	-0.7295
14	150.4	147.0107	142.123:153.135	-3.3893
15	152.2	151.3747	146.487:157.499	-0.8253
16	151.4	154.1999	149.312:160.324	2.7999
17	154.6	155.7917	150.904:161.916	1.1917
18	?	156.3517	151.464:162.476	?

=== Future predictions from end of training data ===

CANADA Consumer Price Index Bakery And Cereal Products Excluding Baby Food (Annual Average)	
inst#	(Annual Average)
1	94.7
2	94.4
3	97.3
4	100
5	104.3
6	107
7	109.8
8	113.6
9	118.1
10	132.4
11	137.9
12	138.8
13	146
14	150.4
15	152.2
16	151.4
17	154.6
18*	156.607
19*	158.2476



=== Evaluation on training data ===

<u>Target</u>	<u>1-step-ahead</u>	<u>2-steps-ahead</u>
CANADA Consumer Price Index Meat (Annual Average)		
N	12	11
Mean absolute error	2.3791	3.306
Root mean squared error	2.9245	3.7608

Total number of instances: 17



Consumer Price Index: Fruit, Fruit Preparation and Nuts

=== Run information ===

Scheme:

SMOreg -C 1.0 -N 0 -I "RegSMOImproved -T 0.001 -V -P 1.0E-12 -L 0.001 -W 1" -K
 "PolyKernel -E 1.0 -C 250007"

Lagged and derived variable options:

-F "CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)"
 -L 1 -M 5

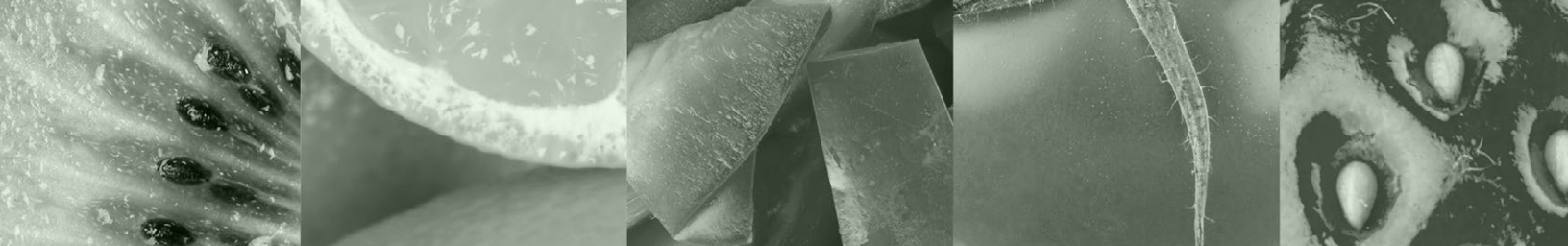
Relation:

Dataset TEST-weka.filters.unsupervised.attribute.
 Remove-R1,7-32,70,77,79-81,83,106-117,119-121

Instances: 17

Attributes: 73

Farm Income	Commodity Price Rice Thai A1
Primary Household Income	Commodity Price Wheat Us Srw
Household Disposable Income	Commodity Price Wheat Us Hrw
Household Net Saving	Commodity Price Banana Europe
Net Lending Or Net Borrowing	Global Aid
Commodity Price Banana US	Population Africa
Commodity Price Orange	Population Americas
Commodity Price Beef	Population Asia
Commodity Price Meat Chicken	Population Europe
Commodity Price Meat Sheep	Population Oceania
Commodity Price Shrimps Mexican	CANADA Consumer Price Index Energy
Commodity Price Sugar EU	Temperature
Commodity Price Sugar US	Us Credit To Agriculture
Commodity Price Sugar World	Us Overnight Lending
Commodity Price Woodpulp	Futures Soybeans cbot
Commodity Price Cotton A	Futures Soybean Meal cbot
Commodity Price Cocoa	Futures Soybean Oil cbot
Commodity Price Coffee Arabica	Futures Canola wce
Commodity Price Coffee Robusta	Futures Corn cbot
Commodity Price Tea Avg 3 Auctions	Futures Wheat cbot
Commodity Price Tea Colombo	Futures Wheat kcbot
Commodity Price Tea Kolkata	Futures Wheat mge
Commodity Price Tea Mombasa	Futures Oats cbot
Commodity Price Coconut Oil	Futures Rough Rice cbot
Commodity Price Copra	Futures Live Cattle cme
Commodity Price Groundnuts	Futures Feeder Cattle cme
Commodity Price Fish Meal	Futures Lean Hogs cme
Commodity Price Groundnut Oil	Futures Class Iii Milk cme
Commodity Price Palm Oil	Futures Cocoa ice
Commodity Price Palm Kernel Oil	Futures Coffee C ice
Commodity Price Soybeans	Futures Orange Juice ice
Commodity Price Soybean Oil	Futures Sugar 11 Ice
Commodity Price Soybean Meal	Futures London Cocoa lce
Commodity Price Barley	Futures London Sugar lce
Commodity Price Maize	CANADA Consumer Price Index Fruit Fruit
Commodity Price Sorghum	Preparations And Nuts (Annual Average)
Commodity Price Rice Thai 5Percent	
Commodity Price Rice Thai 25Percent	



Transformed training data:

CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)
ArtificialTimeIndex
Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-1
Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-2
Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-3
Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-4
Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-5
ArtificialTimeIndex^2
ArtificialTimeIndex^3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-1
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-2
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-4
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-5

CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average):
SMOreg

weights (not support vectors):

+ 0.3285 * (normalized) ArtificialTimeIndex
+ 0.0269 * (normalized) Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-1
- 0.1104 * (normalized) Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-2
+ 0.0029 * (normalized) Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-3
- 0.1553 * (normalized) Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-4
+ 0.1175 * (normalized) Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-5
+ 0.2719 * (normalized) ArtificialTimeIndex^2
+ 0.2424 * (normalized) ArtificialTimeIndex^3
+ 0.1927 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-1
- 0.1785 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-2
- 0.0433 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-3
+ 0.2283 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-4
+ 0.011 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)-5
+ 0.0313

Number of kernel evaluations: 153 (97.556% cached)



=== Predictions for training data: CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
7	98.8	98.7577	97.144:101.832	-0.0423
8	101.3	101.7655	100.152:104.839	0.4655
9	105.7	105.5594	103.946:108.633	-0.1406
10	107.4	107.4694	105.856:110.543	0.0694
11	113.1	110.0262	108.412:113.1	-3.0738
12	112	112.4223	110.809:115.496	0.4223
13	115.9	114.6497	113.036:117.723	-1.2503
14	119.5	119.3009	117.687:122.375	-0.1991
15	122.3	122.2995	120.686:125.373	-0.0005
16	125.8	127.4137	125.8:130.488	1.6137
17	132.4	130.9028	129.289:133.977	-1.4972
18	?	135.5785	133.965:138.652	?

=== Future predictions from end of training data ===

CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)	
inst#	Average
1	93.8
2	90.8
3	97.2
4	100
5	98.2
6	99.3
7	98.8
8	101.3
9	105.7
10	107.4
11	113.1
12	112
13	115.9
14	119.5
15	122.3
16	125.8
17	132.4
18*	135.7545
19*	140.1163



=== Evaluation on training data ===

Target	1-step-ahead	2-steps-ahead
CANADA Consumer Price Index Fruit Fruit Preparations And Nuts (Annual Average)		
N	12	11
Mean absolute error	0.8419	0.7977
Root mean squared error	1.2303	1.218

Total number of instances: 17



Consumer Price Index: Vegetable and Vegetables Preparations

=== Run information ===

Scheme:

SM0reg -C 1.0 -N 0 -I "RegSM0Improved -T 0.001 -V -P 1.0E-12 -L 0.001 -W 1" -K
 "PolyKernel -E 1.0 -C 250007"

Lagged and derived variable options:

-F "CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual
 Average)" -L 1 -M 5

Relation:

Dataset TEST-weka.filters.unsupervised.attribute.
 Remove-R1,7-22,70,77,79-81,83-84,106-118,120-121

Instances: 17

Attributes: 82

Farm Income	Commodity Price Palm Oil
Primary Household Income	Commodity Price Palm Kernel Oil
Household Disposable Income	Commodity Price Soybeans
Household Net Saving	Commodity Price Soybean Oil
Net Lending Or Net Borrowing	Commodity Price Soybean Meal
Canada Unemployment 15 Years And Over	Commodity Price Barley
Canada Unemployment 15 To 24 Years	Commodity Price Maize
Canada Unemployment 25 Years And Over	Commodity Price Sorghum
Canada Unemployment 25 To 44 Years	Commodity Price Rice Thai 5Percent
Canada Unemployment 45 Years And Over	Commodity Price Rice Thai 25Percent
Usa Unemployment 15 Years And Over	Commodity Price Rice Thai A1
Usa Unemployment 15 To 24 Years	Commodity Price Wheat Us Srw
Usa Unemployment 25 Years And Over	Commodity Price Wheat Us Hrw
Usa Unemployment 25 To 44 Years	Commodity Price Banana Europe
Usa Unemployment 45 Years And Over	Global Aid
Commodity Price Banana US	Population Africa
Commodity Price Orange	Population Americas
Commodity Price Beef	Population Asia
Commodity Price Meat Chicken	Population Europe
Commodity Price Meat Sheep	Population Oceania
Commodity Price Shrimps Mexican	CANADA Consumer Price Index Energy
Commodity Price Sugar EU	Temperature
Commodity Price Sugar US	Us Overnight Lending
Commodity Price Sugar World	Futures Soybeans cbot
Commodity Price Woodpulp	Futures Soybean Meal cbot
Commodity Price Cotton A	Futures Soybean Oil cbot
Commodity Price Cocoa	Futures Canola wce
Commodity Price Coffee Arabica	Futures Corn cbot
Commodity Price Coffee Robusta	Futures Wheat cbot
Commodity Price Tea Avg 3 Auctions	Futures Wheat kcbt
Commodity Price Tea Colombo	Futures Wheat mge
Commodity Price Tea Kolkata	Futures Oats cbot
Commodity Price Tea Mombasa	Futures Rough Rice cbot
Commodity Price Coconut Oil	Futures Live Cattle cme
Commodity Price Copra	Futures Feeder Cattle cme
Commodity Price Groundnuts	Futures Lean Hogs cme
Commodity Price Fish Meal	Futures Class Iii Milk cme
Commodity Price Groundnut Oil	Futures Cocoa ice



Futures Coffee C ice
Futures Orange Juice ice
Futures Sugar 11 Ice
Futures London Cocoa lce

Futures London Sugar lce
CANADA Consumer Price Index Vegetables And
Vegetable Preparations (Annual Average)

Transformed training data:

CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)
ArtificialTimeIndex
Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)-1
Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)-2
Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)-3
Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)-4
Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)-5
ArtificialTimeIndex^2
ArtificialTimeIndex^3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations
(Annual Average)-1
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations
(Annual Average)-2
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations
(Annual Average)-3
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations
(Annual Average)-4
ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables And Vegetable Preparations
(Annual Average)-5

CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average):
SM0reg

weights (not support vectors):

+ 0.3183 * (normalized) ArtificialTimeIndex
+ 0.0391 * (normalized) Lag_CANADA Consumer Price Index Vegetables And Vegetable
Preparations (Annual Average)-1
- 0.0193 * (normalized) Lag_CANADA Consumer Price Index Vegetables And Vegetable
Preparations (Annual Average)-2
- 0.1414 * (normalized) Lag_CANADA Consumer Price Index Vegetables And Vegetable
Preparations (Annual Average)-3
+ 0.1046 * (normalized) Lag_CANADA Consumer Price Index Vegetables And Vegetable
Preparations (Annual Average)-4
- 0.0762 * (normalized) Lag_CANADA Consumer Price Index Vegetables And Vegetable
Preparations (Annual Average)-5
+ 0.3197 * (normalized) ArtificialTimeIndex^2
+ 0.3698 * (normalized) ArtificialTimeIndex^3
- 0.0409 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables
And Vegetable Preparations (Annual Average)-1
- 0.1841 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables
And Vegetable Preparations (Annual Average)-2
- 0.1492 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables
And Vegetable Preparations (Annual Average)-3
+ 0.225 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables And
Vegetable Preparations (Annual Average)-4
+ 0.1721 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Vegetables
And Vegetable Preparations (Annual Average)-5
+ 0.0399

Number of kernel evaluations: 153 (99.121% cached)



=== Predictions for training data: CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
7	93.6	93.681	91.162:99.42	0.081
8	98.4	98.4008	95.882:104.14	0.0008
9	98.6	99.8761	97.358:105.615	1.2761
10	100.6	102.1762	99.658:107.915	1.5762
11	110.2	104.7195	102.201:110.458	-5.4805
12	109.3	109.0339	106.515:114.773	-0.2661
13	117.1	111.3611	108.842:117.1	-5.7389
14	113.3	113.6026	111.084:119.342	0.3026
15	117.4	119.9186	117.4:125.658	2.5186
16	122.5	122.578	120.059:128.317	0.078
17	130.8	130.7147	128.196:136.454	-0.0853
18	?	133.7596	131.241:139.499	?

=== Future predictions from end of training data ===

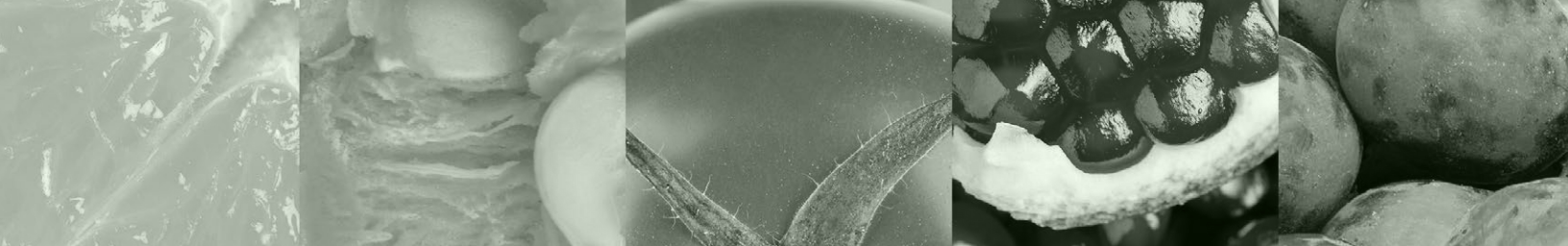
inst#	CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)
1	86.9
2	88
3	93.3
4	100
5	94.3
6	92.1
7	93.6
8	98.4
9	98.6
10	100.6
11	110.2
12	109.3
13	117.1
14	113.3
15	117.4
16	122.5
17	130.8
18*	133.7622
19*	138.9634



=== Evaluation on training data ===

Target	1-step-ahead	2-steps-ahead
CANADA Consumer Price Index Vegetables And Vegetable Preparations (Annual Average)		
N	12	11
Mean absolute error	1.4483	1.5822
Root mean squared error	2.4845	2.5868

Total number of instances: 17



Consumer Price Index: Other Food Products and Non-Alcoholic Beverages

=== Run information ===

Scheme:

SM0reg -C 1.0 -N 0 -I "RegSM0Improved -T 0.001 -V -P 1.0E-12 -L 0.001 -W 1" -K "PolyKernel -E 1.0 -C 250007"

Lagged and derived variable options:

-F "CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)" -L 1 -M 5

Relation:

Dataset TEST-weka.filters.unsupervised.attribute.Remove-R1,9-32,81-82,106-119,121

Instances: 17

Attributes: 79

Farm Income	Commodity Price Rice Thai 25Percent
Primary Household Income	Commodity Price Rice Thai A1
Household Disposable Income	Commodity Price Wheat Us Srw
Household Net Saving	Commodity Price Wheat Us Hrw
Net Lending Or Net Borrowing	Commodity Price Banana Europe
Immigrants Mean With Income	Fao Food Price Index
Immigrants Total With Income Persons	Global Aid
Commodity Price Banana US	Population Africa
Commodity Price Orange	Population Americas
Commodity Price Beef	Population Asia
Commodity Price Meat Chicken	Population Europe
Commodity Price Meat Sheep	Population Oceania
Commodity Price Shrimps Mexican	Crude Oil
Commodity Price Sugar EU	CANADA Consumer Price Index Energy
Commodity Price Sugar US	CAD Vs USD
Commodity Price Sugar World	Agriculture Production
Commodity Price Woodpulp	Potash
Commodity Price Cotton A	Us Credit To Agriculture
Commodity Price Cocoa	Us Overnight Lending
Commodity Price Coffee Arabica	Futures Soybeans cbot
Commodity Price Coffee Robusta	Futures Soybean Meal cbot
Commodity Price Tea Avg 3 Auctions	Futures Soybean Oil cbot
Commodity Price Tea Colombo	Futures Canola wce
Commodity Price Tea Kolkata	Futures Corn cbot
Commodity Price Tea Mombasa	Futures Wheat cbot
Commodity Price Coconut Oil	Futures Wheat kcbt
Commodity Price Copra	Futures Wheat mge
Commodity Price Groundnuts	Futures Oats cbot
Commodity Price Fish Meal	Futures Rough Rice cbot
Commodity Price Groundnut Oil	Futures Live Cattle cme
Commodity Price Palm Oil	Futures Feeder Cattle cme
Commodity Price Palm Kernel Oil	Futures Lean Hogs cme
Commodity Price Soybeans	Futures Class Iii Milk cme
Commodity Price Soybean Oil	Futures Cocoa ice
Commodity Price Soybean Meal	Futures Coffee C ice
Commodity Price Barley	Futures Orange Juice ice
Commodity Price Maize	Futures Sugar 11 Ice
Commodity Price Sorghum	Futures London Cocoa lce
Commodity Price Rice Thai 5Percent	Futures London Sugar lce



CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)

Transformed training data:

CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)
 ArtificialTimeIndex
 Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-1
 Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-2
 Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-3
 Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-4
 Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-5
 ArtificialTimeIndex^2
 ArtificialTimeIndex^3
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-1
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-2
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-3
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-4
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-5

CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average):
 SM0reg

weights (not support vectors):

+ 0.4607 * (normalized) ArtificialTimeIndex
 + 0.2847 * (normalized) Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-1
 + 0.0141 * (normalized) Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-2
 - 0.0821 * (normalized) Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-3
 - 0.1645 * (normalized) Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-4
 - 0.0972 * (normalized) Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-5
 + 0.2739 * (normalized) ArtificialTimeIndex^2
 + 0.0771 * (normalized) ArtificialTimeIndex^3
 - 0.0191 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-1
 - 0.0382 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-2
 + 0.1146 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-3
 + 0.0545 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-4
 + 0.1647 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)-5
 - 0.0309



Number of kernel evaluations: 153 (97.276% cached)

=== Predictions for training data: CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
7	107	106.621	105.016:111.497	-0.379
8	108.9	108.996	107.391:113.872	0.096
9	110.1	111.416	109.811:116.292	1.316
10	112.8	113.9511	112.346:118.827	1.1511
11	120.5	116.5856	114.981:121.462	-3.9144
12	124.1	119.5695	117.965:124.446	-4.5305
13	128.2	123.3236	121.719:128.2	-4.8764
14	131	126.3938	124.789:131.27	-4.6062
15	129.9	128.7929	127.188:133.669	-1.1071
16	129.8	131.4049	129.8:136.281	1.6049
17	133.7	134.2557	132.651:139.132	0.5557
18	?	137.891	136.286:142.767	?

=== Future predictions from end of training data ===

inst#	CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)
1	97
2	97.3
3	99
4	100
5	103.3
6	104.4
7	107
8	108.9
9	110.1
10	112.8
11	120.5
12	124.1
13	128.2
14	131
15	129.9
16	129.8
17	133.7
18*	137.8713
19*	142.9227



=== Evaluation on training data ===

<u>Target</u>	<u>1-step-ahead</u>	<u>2-steps-ahead</u>
CANADA Consumer Price Index Other Food Products And Nonalcoholic Beverages (Annual Average)		
N	12	11
Mean absolute error	1.5991	2.1943
Root mean squared error	2.2325	2.8311

Total number of instances: 17



Consumer Price Index: Food Purchased from Restaurants

=== Run information ===

Scheme:

SMOreg -C 1.0 -N 0 -I "RegSMOImproved -T 0.001 -V -P 1.0E-12 -L 0.001 -W 1" -K
 "PolyKernel -E 1.0 -C 250007"

Lagged and derived variable options:

-F "CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)"
 -L 1 -M 8

Relation:

Dataset TEST-weka.filters.unsupervised.attribute.Remove-R1,9-32,81,106-120

Instances: 17

Attributes: 80

Farm Income	Commodity Price Wheat Us Srw
Primary Household Income	Commodity Price Wheat Us Hrw
Household Disposable Income	Commodity Price Banana Europe
Household Net Saving	Fao Food Price Index
Net Lending Or Net Borrowing	Global Aid
Immigrants Mean With Income	Population Africa
Immigrants Total With Income Persons	Population Americas
Commodity Price Banana US	Population Asia
Commodity Price Orange	Population Europe
Commodity Price Beef	Population Oceania
Commodity Price Meat Chicken	Crude Oil
Commodity Price Meat Sheep	CANADA Consumer Price Index Energy
Commodity Price Shrimps Mexican	CAD Vs USD
Commodity Price Sugar EU	Agriculture Production
Commodity Price Sugar US	Temperature
Commodity Price Sugar World	Potash
Commodity Price Woodpulp	Us Credit To Agriculture
Commodity Price Cotton A	Us Overnight Lending
Commodity Price Cocoa	Futures Soybeans cbot
Commodity Price Coffee Arabica	Futures Soybean Meal cbot
Commodity Price Coffee Robusta	Futures Soybean Oil cbot
Commodity Price Tea Avg 3 Auctions	Futures Canola wce
Commodity Price Tea Colombo	Futures Corn cbot
Commodity Price Tea Kolkata	Futures Wheat cbot
Commodity Price Tea Mombasa	Futures Wheat kcbt
Commodity Price Coconut Oil	Futures Wheat mge
Commodity Price Copra	Futures Oats cbot
Commodity Price Groundnuts	Futures Rough Rice cbot
Commodity Price Fish Meal	Futures Live Cattle cme
Commodity Price Groundnut Oil	Futures Feeder Cattle cme
Commodity Price Palm Oil	Futures Lean Hogs cme
Commodity Price Palm Kernel Oil	Futures Class Iii Milk cme
Commodity Price Soybeans	Futures Cocoa ice
Commodity Price Soybean Oil	Futures Coffee C ice
Commodity Price Soybean Meal	Futures Orange Juice ice
Commodity Price Barley	Futures Sugar 11 Ice
Commodity Price Maize	Futures London Cocoa lce
Commodity Price Sorghum	Futures London Sugar lce
Commodity Price Rice Thai 5Percent	CANADA Consumer Price Index Food
Commodity Price Rice Thai 25Percent	Purchased From Restaurants (Annual
Commodity Price Rice Thai A1	Average)



Transformed training data:

CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)
 ArtificialTimeIndex
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-1
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-2
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-3
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-4
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-5
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-6
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-7
 Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-8
 ArtificialTimeIndex^2
 ArtificialTimeIndex^3
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-1
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-2
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-3
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-4
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-5
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-6
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-7
 ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-8

CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average):

SMOreg

weights (not support vectors):

+ 0.5816 * (normalized) ArtificialTimeIndex
 + 0.1103 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-1
 + 0.0126 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-2
 - 0.0011 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-3
 + 0.0108 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-4
 + 0.0031 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-5
 + 0.0088 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-6
 + 0.0354 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-7
 + 0.0085 * (normalized) Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-8
 + 0.3107 * (normalized) ArtificialTimeIndex^2
 + 0.0605 * (normalized) ArtificialTimeIndex^3
 + 0.0164 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-1
 - 0.0378 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-2
 - 0.0329 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-3



- 0.0138 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-4
 - 0.0104 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-5
 - 0.0295 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-6
 - 0.045 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-7
 - 0.0601 * (normalized) ArtificialTimeIndex*Lag_CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)-8
 + 0.0736

Number of kernel evaluations: 153 (98.834% cached)

=== Predictions for training data: CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average) (2-steps ahead) ===

inst#	actual	predicted	conf	error
10	117	117.7022	117:119.128	0.7022
11	121.1	120.4143	119.712:121.84	-0.6857
12	124	123.2027	122.5:124.628	-0.7973
13	127.5	126.1425	125.44:127.568	-1.3575
14	130.6	129.1743	128.472:130.6	-1.4257
15	132.6	132.3509	131.649:133.777	-0.2491
16	135.2	135.6325	134.93:137.058	0.4325
17	138.9	139.0243	138.322:140.45	0.1243
18	?	142.6199	141.918:144.046	?



=== Future predictions from end of training data ===

CANADA Consumer Price Index Food Purchased From Restaurants (Annual Average)	
inst#	Average
1	92
2	94
3	96.9
4	100
5	102.5
6	105.2
7	108.2
8	111.1
9	114.1
10	117
11	121.1
12	124
13	127.5
14	130.6
15	132.6
16	135.2
17	138.9
18*	142.6113
19*	146.2748

=== Evaluation on training data ===

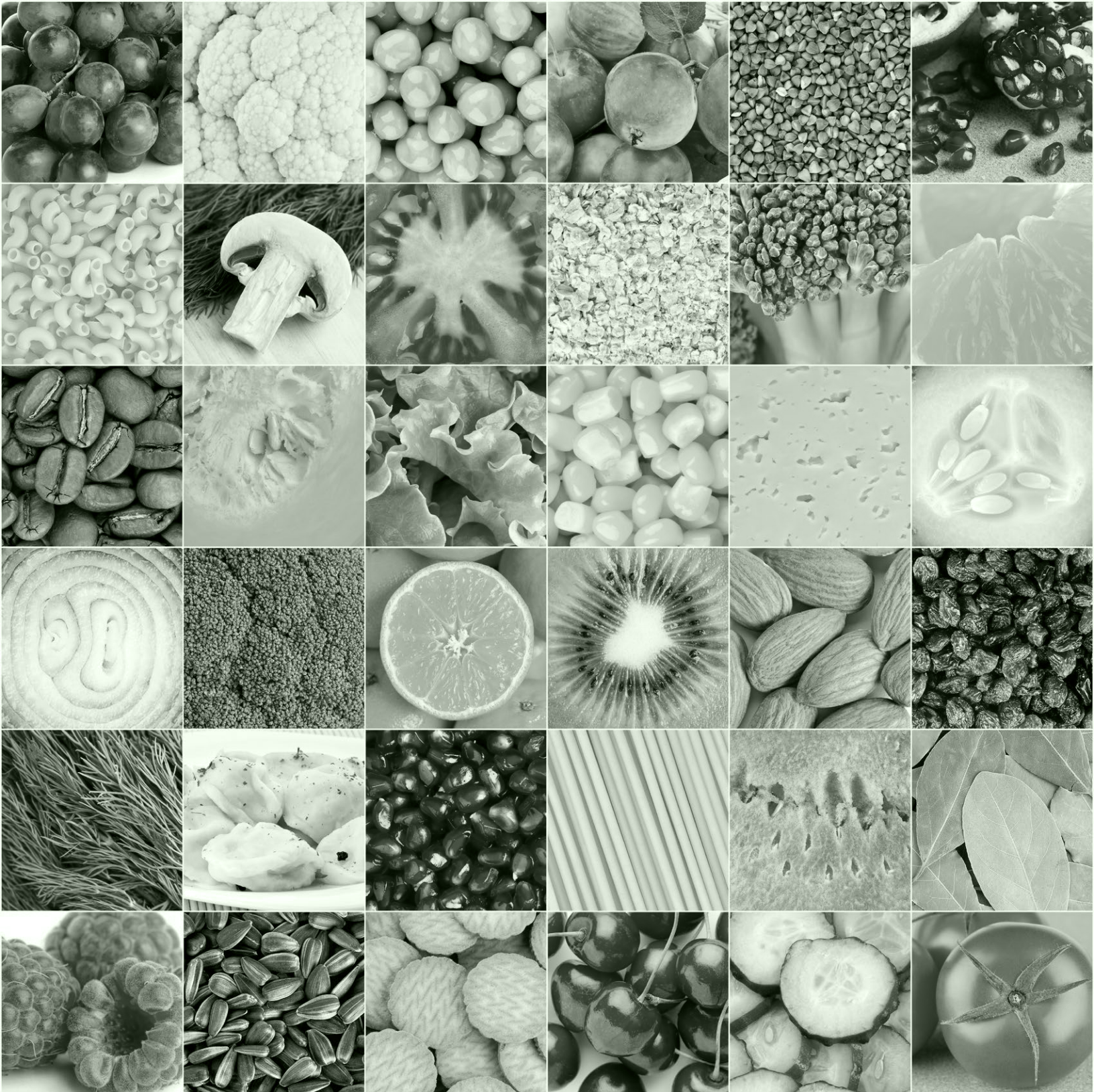
Target	1-step-ahead	2-steps-ahead
CANADA Consumer Price Index Meat (Annual Average)		
N	9	8
Mean absolute error	0.6717	0.7218
Root mean squared error	0.7868	0.847

Total number of instances: 17

REFERENCES

Schabenberger, O. (2016, 06 30). *The difference between Statistical Modeling and Machine Learning, as I see it*. Retrieved from LinkedIn: <https://www.linkedin.com/pulse/difference-between-statistical-modeling-machine-i-see-schabenberger>

Witten, I. H., Frank, E., & Hall, M. A. (2011). *Data Mining: Practical Machine Learning Tools and Techniques*. Burlington, MA: Elsevier Inc.



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