The Impact of Economics Freedom on Economic Growth

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Introduction

There are much literature indicating the relationship of economics freedom and economics growth. But the measurement of economics freedom has always been a controversial issue.
The two most popular indices, the Index of Economic Freedom Composition (Heritage Foundation) and Economic Freedom of the World (Fraser Institute) has been criticked of these following disadvantages:

a. The Heritage index average the factors with equal weights.
b. These two indices all introduce the elements of subjectivity, particularly the factors regarding perceptions.

In order to overcome this two weaknesses, this paper use machine learning methods to construct a new economic freedom index that measure four basic areas - government influence, legal structure and property rights, open markets, and access to sound money. This four basic areas includes all the key component concepts of these two indices to be most comprehensive.

Eventually, this paper empirically examines the importance of economic freedom on economics growth by using the new constructed machine learning index.

New index Components

Features to construct the new index consists of:

- government integrity
- size of government
- government spending
- tax burden
- legal system & property rights
- business freedom
- monetary freedom
- trade freedom
- investment freedom
- financial freedom
- sound money

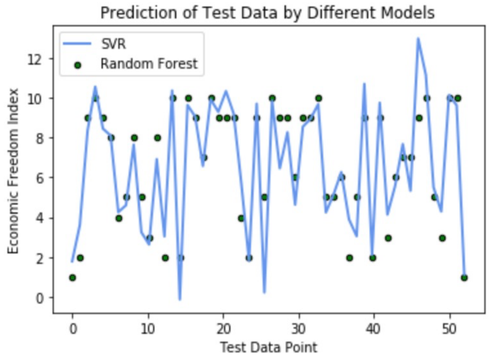
Methods

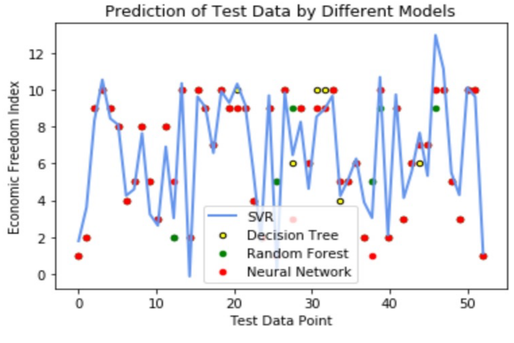
- Constructing the new index:

This paper compares 6 different machine learning models - SVR model with three different kernels, Random Forest, Decision Tree, and Neural Network. Finally, choose SVR model with linear kernel, which the smallest MSE for the testing sample, to construct the new economic freedom index.

Model Comparison

Models		MSE
SVR	RBF kernel	2.9923008
	linear kernel	0.9754689
	polynomial kernel	1.16029322
Random Forest		1.07692308
Decision Tree		1.15384615
Neural Network		1.30769231





The SVR model with linear kernel has the least MSE, and the continuity of its output index allow us to estimate the impact of lag of economic freedom index more accurately, since the lag of economic freedom level has a large probability of being the same as concurrent economic freedom level in the discrete output. Therefore, I selected SVR model with linear kernel to construct the new index.

Methods

- Main model:

$$y_{i,t} = \beta_0 + \beta_1 Index_{i,t} + \beta_2 M_{i,t} + \beta_3 Z_{i,t} + \varepsilon_{i,t}$$

$y_{i,t}$ is the per capita GDP of country i at year t; $Index_{i,t}$ is our new constructed economic freedom index; $M_{i,t}$ is a vector of standard economic explanatory variables, which have shown to be robustly linked with GDP by previous empirical studies; $Z_{i,t}$ is a vector of possible additional economic explanatory variables, which may be related to GDP based on previous literature.

The variables in M vector includes the investment share of GDP, the average years of schooling to proxy human capital and education, the trade share to reflect openness, the government consumption.

The variables in Z vector consists of the life expectancy at birth, mortality rate of infants, population growth and inflation rate.

Estimated with fixed effects based on 100 countries' data from 2000 to 2017.

Limitations

- Lack of Data: Because constructing the index considers 11 features and there are 9 variables in main model, there are lots of missing values in the data collecting process. At last, there only lefts 100 countries to be considered.
- Lack of Parameter Tuning Experience: Only tune the parameter of SVR model, Decision Tree model and Neural Network model.

Potential Future Research

- Predict the GDP per capita based on the new constructed index by machine learning methods, e.g. Neural Network.
- Examine the relationship between economic freedom and other variables based on the new constructed index, such as FDI, market efficiency, etc.

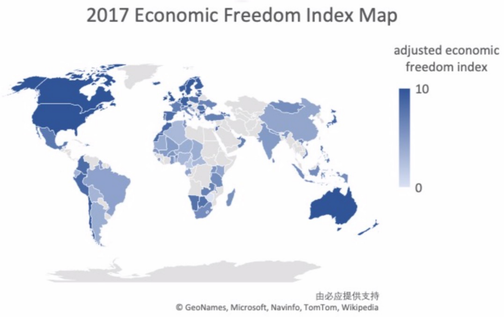
Acknowledgements

Very grateful to my director, Dr. Rick Evans, for his guidance of my thesis, who made my understanding of academic writing deeper in the last two quarters and taught me a lot of specific research skills, especially machine learning methods.

"Hope this paper will not be the end of academic thinking."

Results

- New Index:



Estimation Results

Dependent Variable: GDP per capita	(1)	(2)	(3)	(4)	(5)	(6)	(7)
economic freedom	658.47***	648.24***	597.55***	528.29***	276.27*	453.86***	469.17***
	(4.17)	(4.10)	(3.90)	(3.48)	(1.89)	(3.23)	(3.38)
L.economic freedom	730.22***	730.04***	608.07***	524.69***	141.32	265.78*	256.23*
	(4.80)	(4.81)	(4.14)	(3.60)	(1.00)	(1.95)	(1.90)
investment share		57.24**	47.05*	24.95	0.031	68.78**	54.59**
		(1.96)	(1.67)	(0.89)	(0.00)	(2.63)	(2.11)
government consumption			1.98e-09***	2.02e-08***	1.54e-08***	1.50e-08***	1.52e-08***
			(11.06)	(11.42)	(9.07)	(9.24)	(9.49)
trade share				68.56***	42.29***	33.12***	35.22***
				(7.15)	(4.59)	(3.73)	(4.02)
years of schooling					3771.35***	3843.55***	3902.01***
					(14.48)	(12.77)	(13.08)
life expectancy at birth						768.122***	739.77***
						(7.16)	(6.98)
mortality rate						401.69***	390.19***
						(11.45)	(11.25)
inflation rate							922.83***
							(6.28)
population growth							30.20*
							(1.72)

* significant at 90% level.
** significant at 95% level.
*** significant at 99% level.

- The empirical result shows that economic freedom is related to GDP with a significant positive coefficient in every model. Before adding years of schooling into the regression, the lag of economic freedom has almost the same large impact on GDP with the concurrent economic freedom and robust. Both the impact level and the significance of the lag of economic freedom decrease after years of schooling has been considered. But in equation (6) and (7), it still exerts a significant and strong impact on GDP, although the impact is less than concurrent economic freedom level.

- After the impact of years of schooling, life expectancy at birth and mortality rate has been considered, the investment share has been proved to be robustly positive related to economic growth.
- The government consumption exerted a significant but relatively small impact on GDP per capita in every model.
- The proxy of openness, education and health - trade share, years of schooling and life expectancy at birth all exert a robust and strong impact on economic growth, which is consistent with findings of previous literature.
- A negative sign for mortality rate is expected, however, the actual result indicates the mortality rate of infants is positively linked with GDP.
- The inflation rate and population growth has always been positively related to GDP.

Conclusion

The empirical results show that economic freedom is a significant determinant of economic growth, even when education, health and openness are taken into account.

And the lag 1 period of economic freedom level also have positive and robust impact on economics growth.