A Machine Learning Approach to Equity Bubble Detection and Market Crash Prediction

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Abstract

This is the abstract section.

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Introduction

Bubbles and financial crashes are important themes of financial markets. Asset bubbles describe the situation where asset prices significantly deviate from their fundamental values. Notable historical bubble includes the Dutch tulip mania in 1637, the dot-com bubble in 1990s, and the US housing bubble in 2000s. Investors who are unaware of the potential risks of bubbles paid huge prices when markets crashed.

According to people, this happened (Chatzis et al., 2018).

Background

Model

Model selection

Random Forests

GDP. According to people, this happened again (Chatzis et al., 2018).

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As shown in Figure 1

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$$\text{logit}(P(Y)) = \log \frac{P(Y)}{1 - P(Y)} = X\beta \tag{1}$$

As shown in Table 1

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Table 1

	Dependent variable:
	bubble
real_gdp_growth	0.012
	(0.034)
inflation	0.093***
	(0.028)
tbill_yield	0.234***
	(0.071)
shiller_pe	−0.661***
	(0.058)
consumer_confidence	−1.279***
	(0.154)
mktcap_gdp_ratio	217.538***
	(18.556)
sp500_return	−0.092***
	(0.033)
sp500_re3	0.034
	(0.022)
sp500_re6	−0.049**
	(0.019)
sp500_re12	−0.126***
	(0.015)
sp500_re60	0.077***
	(0.006)
Constant	115.874***
	(14.361)
Observations	1,103
Log Likelihood	−411.350
Akaike Inf. Crit.	846.699
Note:	*p<0.1; **p<0.05; ***p<0.01

Figure 1

CV-tuned decision threshold

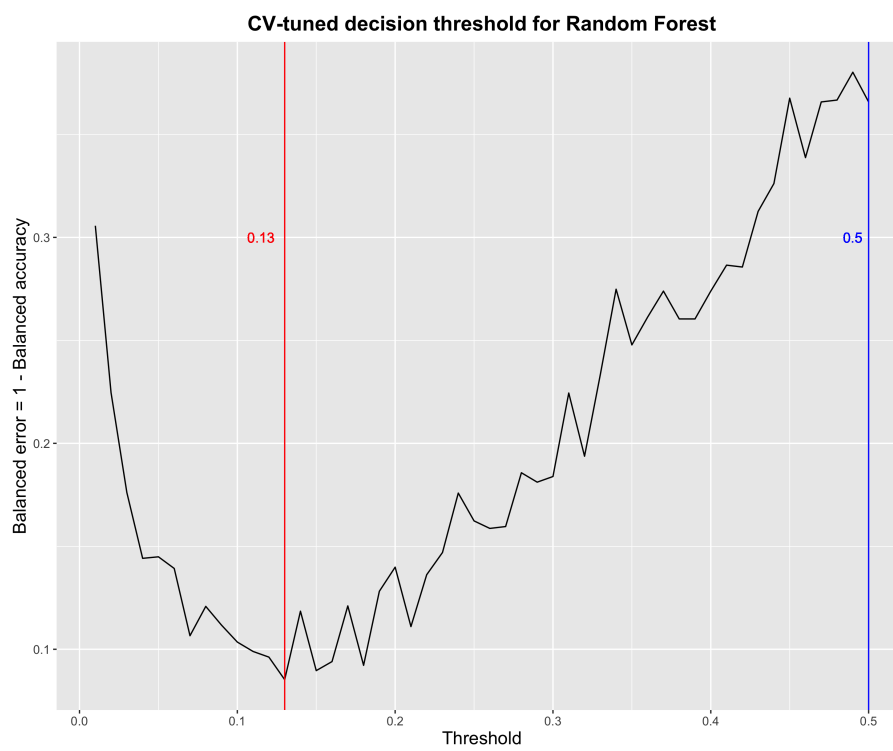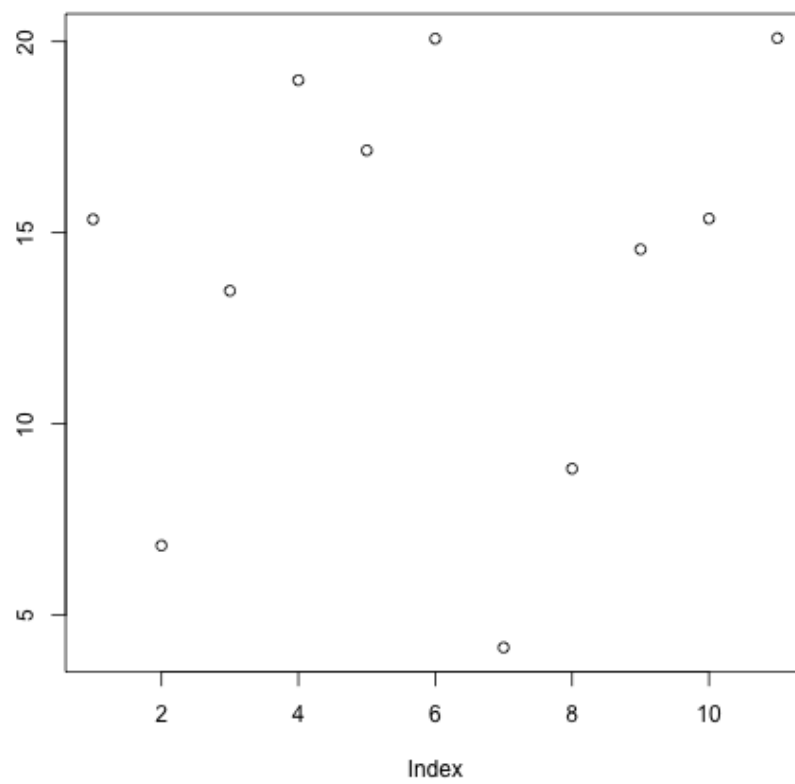CV-tuned decision threshold for Random Forest

Figure 2

Variable Importance

References

Chatzis, S. P., Siakoulis, V., Petropoulos, A., Stavroulakis, E., & Vlachogiannakis, N. (2018). Forecasting stock market crisis events using deep and statistical machine learning techniques. *Expert Systems with Applications, 112*, 353–371. https://doi.org/https://doi.org/10.1016/j.eswa.2018.06.032