Identify Sustainable Credit Gap

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Introduction

Introduction

- Motivation
- Contribution

Methodology

- Data
- Empirical Model
- ► Results

Motivation

To overcome model uncertainty in using credit gap as an early warning indicator (EWI) of systemic financial crises, we propose

using model averaging of different credit gap measurements. The method is based on Bayesian Model Average - Raftery (1995)

Motivation

► Area under the curve of operating characteristic (AUROC or AUC) has been widely used as a criterion to determine the

performance of a FWI. But it has received some criticism.

Model

Credit gap creation

$$100 * \frac{Credit}{GDP} = y_t = \tau_{yt} + c_{yt} \tag{1}$$

We created 90 candidate one-sided credit gap measurements based on the literature.

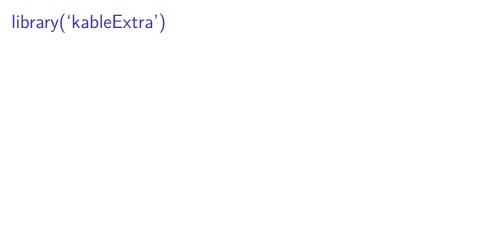
logit regression:

$$pre.crisis_{it} \sim credit.gap_{itj}$$
 (2)

- \blacktriangleright where *pre.crisis*_{it} = 1 or 0
- i is country indicator. j is credit gap filter type
- ► The pre-crisis indicator is set to 1 when t is between 5-12 quarters before a systemic crisis.
- ► We discard measurements between 1-4 quarters before a crisis, periods during a crisis and post-crisis periods identified in Lo



```
options(knitr.table.format = "pandoc")
```





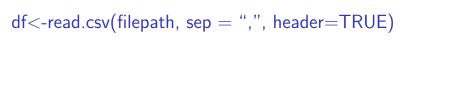






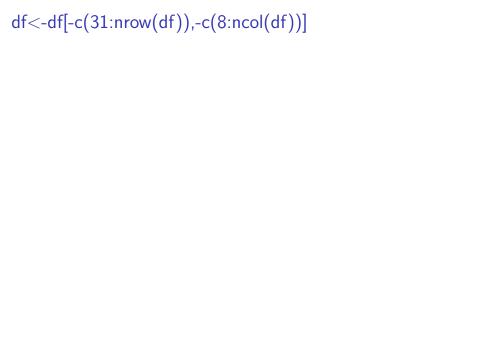






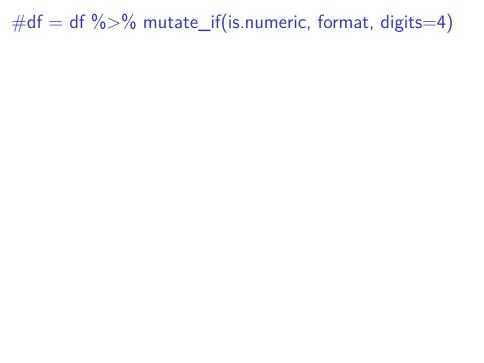
```
\mathsf{rownames}(\mathsf{df}) < - \mathsf{df}[,1]
```





#colnames(df) <- c("Median", "10pct", "90pct", "Median", "10pct", "90pct", "Median", "10pct", "90pct")

#options(knitr.kable.NA = '')

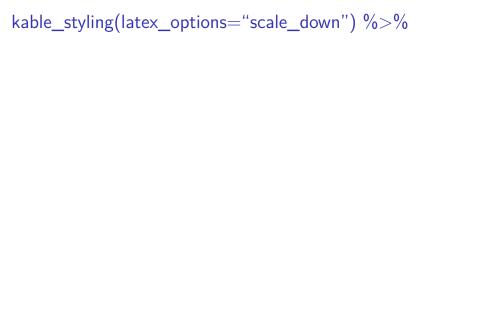


```
\#kbl(data.frame(x=rnorm(10), y=rnorm(10), x=rnorm(10)), digits = c(1, 4, 4))
```

kable_paper("striped") %>%

#add_header_above(c("Parameters" = 1, "VAR2" = 3, "VAR2 1-cross lag" = 3, "VAR2 2-cross lags" = 3)) %>%

#footnote(general="UK Bayesian regression results") %>%



```
column_spec(4, bold = TRUE)\#c(0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0)
```

Model averaging

Model posterior probability

Bayesian Model Averging

The Bayesian Model Average method is formalized in Raftery (1995).

equation (33): Model posterior probability:

$$P(M_k|D) = \frac{P(D|M_k)P(M_k)}{\sum_{l=1}^{K} P(D|M_l)P(M_l)} \approx \frac{\exp(-\frac{1}{2}BlC_k)}{\sum_{l=1}^{K} \exp(-\frac{1}{2}BlC_l)}$$
(3)

- Where $P(M_k)$ is model prior probability and can be ignored if all models are assumed equal prior weights.
- $P(D|M_k)$ is marginal likehood. And $P(D|M_k) \propto exp(-\frac{1}{2}BIC_k)$
- In which $BIC_k = 2log(Bayesfactor_{sk}) = \chi_{sk}^2 df_k log(n)$. s indicates saturated model.

Model posterior probability

▶
$$BIC_k = 2log(Bayesfactor_{sk}) = \chi_{sk}^2 - df_k log(n)$$

$$\chi^2_{sk}$$
 is the deviance of model K from the saturated model

Weighted credit gap creation

Weighted credit gap motivation

$$\widehat{pre.crisis}_{ti} = \widehat{response}_{ti} = \frac{1}{1 - \exp(a + \sum_j \hat{\beta}_j c_{tij})}$$

With
$$\hat{\beta}_j = E[\beta_j | D, B_j \neq 0] = \sum_{A_j} \hat{\beta}_j(k) p'(M_k | D)$$

We propose a single weighted credit gap \hat{c}_{ti} that satisfy:

$$\frac{1}{1 - exp(a + \hat{\beta}\hat{c}_{ti})} = \frac{1}{1 - exp(a + \sum_{j} \hat{\beta}_{j}c_{tij})}$$

OR

$$\sum_{i} \hat{\beta}_{j} c_{tij} = \hat{\beta} \hat{c}_{ti} \tag{7}$$

Weighted gap creation

Empirical Results

Comparing pAUC of weighted gap

Plot weighted gap against BIS gap