Essays on Measuring Credit and Property Prices Gaps

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Chapter 2: Measuring Credit Gaps

Introduction

Motivation

- No unanimity on how to measure excessive credit. Bank for International Settlements uses HP filter to create a credit gap measurement that performs well in predicting future financial crises. However, there are other competing gap measurements.
- Nelson (2008) that the deviation of a non-stationary variable from its long-run trend should predict future changes of opposite sign in the variable. We utilize this idea and forecast combination method to propose a synthesized credit gap measurement.

Contribution

Since different trend-cycle decomposition methods of credit-to-GDP ratio provide us different credit gap measures, we handle the model uncertainty by assigning weights on these different credit gap measures based on its relative out-of-sample predictive power based on Bates and Granger (1969) forecast combination method.

- Our proposed credit gap measure dominates the alternate credit gaps in terms of its relative out-of-sample predictive power.

Methodology

Data

The measure of credit is total credit to the private non-financial sector, as published in the BIS database, capturing total borrowing from all domestic and foreign sources.

- Quarterly data from 1983:Q1-2020:Q2

Model

All these trend-cycle decomposition methods are based on the premise that a non-stationary series is the sum of a trend and a stationary cyclical component:

$$y_t = \tau_t + c_t \tag{1}$$

Trend-cycle decomposition models

HP filter

$$min_{\tau}(\sum_{t=1}^{T}(y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1}[(\tau_{t-1} - \tau_t) - (\tau_t - \tau_{t-1})]^2) \quad (2)$$

- λ will be set at 1600, 3000, 400000 (BIS Basel Gap) in our models

Unobserved-Component model: Clark(1987)

$$\tau_t = \tau_{t-1} + \eta_t, \eta_t \tilde{} iid(0, \sigma_{\eta}^2) \quad (3)$$

$$c_t = \Phi(L)c_t + u_t, u_t \tilde{} iid(0, \sigma_u^2)$$

Trend-cycle decomposition models

Beveridge-Nelson

$$y_t = y_0 + \mu t + \Psi(1) \sum_{k=1}^{t} u_t + \breve{u}_t - \breve{u}_0 \tag{4}$$

Hamilton filter (2018)

$$y_{t+h} = \alpha + \beta_1 y_{t-1} + \beta_2 y_{t-2} + ... + \beta_p y_{t-p} + v_{t+h} \tag{5}$$

Forecasting model:

$$\Delta y_t = \alpha + \beta(L)\Delta y_{t-1} + \gamma(L)GAP_{t-1} + v_t \tag{6}$$

Baseline Model AR(1):

$$\Delta y_t = \alpha + \beta(L)\Delta y_{t-1} + v_t \tag{7}$$

Forecast combination

$$w_m = \frac{\widehat{\overline{\sigma}}_m^2}{\widehat{\overline{\sigma}}_1^2 + \widehat{\overline{\sigma}}_2^2 + \ldots \widehat{\overline{\sigma}}_M^2} \tag{8}$$

- where $\widehat{\overline{\sigma}}_m^2$ is inverted out-of-sample forecast error variance of forecast M based on the cyclical component M.

Empirical Results:

Forecasting Performance of Credit Gap Models (U.S.)

Horizon	HP	RU	BIS	Hamilton	Linear	Quadratic	BN	UC	Average	Bates-Granger
1	0.993	0.987	1.012	0.994	1.028	1.005	1.010	0.985	0.962	**0.959**
2	0.974	0.963	1.016	0.980	1.058	1.014	0.975	0.961	0.924	**0.917**
3	0.966	0.953	1.023	1.011	1.055	1.036	0.965	0.937	0.906	**0.896**
4	0.982	0.966	1.022	1.029	1.055	1.045	1.033	0.910	0.922	**0.910**
1 - 4	0.964	0.945	1.030	1.005	1.081	1.041	0.978	0.913	0.882	**0.872**

The table shows the ratio of RMSEPs of different models in comparison to the benchmark AR(1) model. The first set of forecasts is for 1994:Q1-1994:Q4; the final set is for 2019:Q3-2020:Q2. Q=1-4 denotes averages over next 4-quarters. HP is Hodrick-Prescott, RU is Ravn-Uhlig, BIS is based on Borio and Lowe (2002), BN is Beveridge-Nelson, UC is Unobserved Component Model.

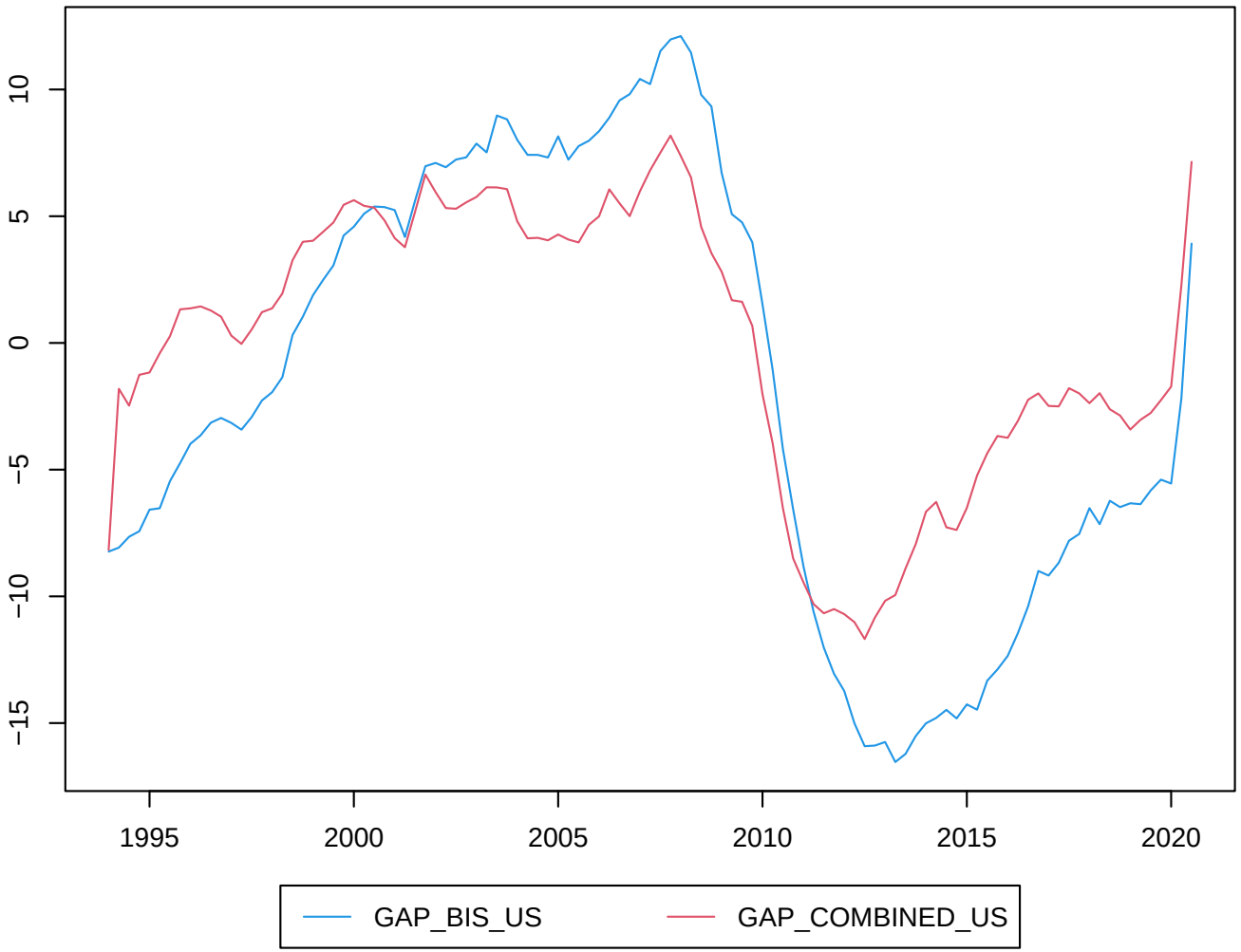
Empirical Results:

Forecasting Performance of Credit Gap Models (U.K.)

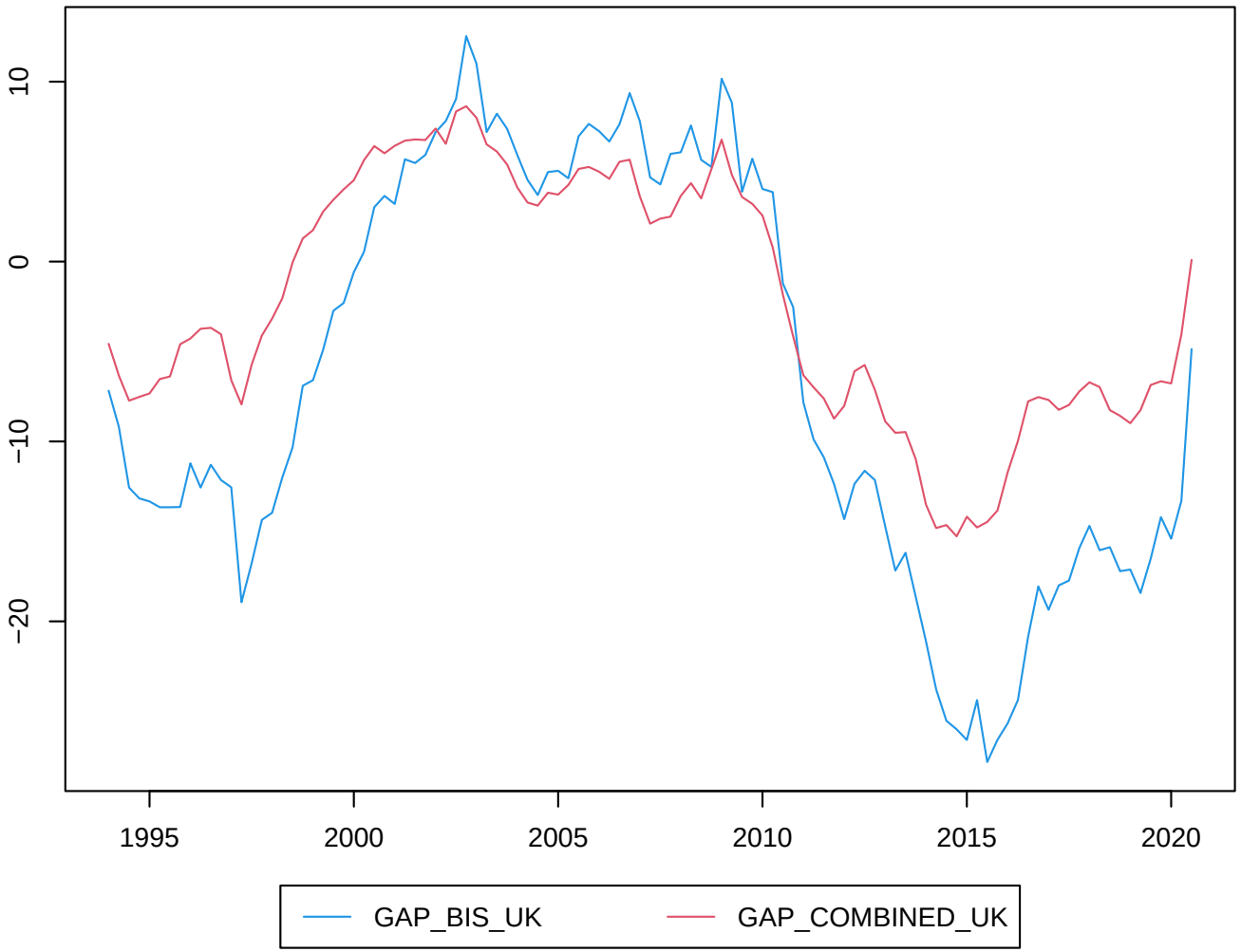
Horizon	HP	RU	BIS	Hamilton	Linear	Quadratic	BN	UC	Average	Bates-Granger
1	1.001	0.990	1.001	0.992	1.010	0.979	1.028	1.009	**0.977**	0.979
2	0.979	0.970	1.007	0.969	1.016	0.962	1.028	0.999	0.962	**0.957**
3	0.979	0.971	1.018	0.969	1.055	0.966	1.009	0.989	0.959	**0.955**
4	0.990	0.987	1.028	1.005	1.055	0.981	1.019	0.981	0.972	**0.967**
1 - 4	0.972	0.952	1.034	0.960	1.081	0.929	1.054	0.985	0.918	**0.910**

The table shows the ratio of RMSEPs of different models in comparison to the benchmark AR(1) model. The first set of forecasts is for 1994:Q1-1994:Q4; the final set is for 2019:Q3-2020:Q2. Q=1-4 denotes averages over next 4-quarters. HP is Hodrick-Prescott, RU is Ravn-Uhlig, BIS is based on Borio and Lowe (2002), BN is Beveridge-Nelson, UC is Unobserved Component Model.

Credit Gap Comparison (U.S.)



Credit Gap Comparison (U.K.)



Conclusion

Our results show that this method of combining credit gaps yield us a credit gap measure that dominates credit gaps from different trend-cycle decomposition methods in terms of superior out-of-sample forecasting of changes in credit-to-GDP ratio.

Thank You

I look forward to your questions and comments