Credit to GDP Gap:
Local Versus Foreign Currency Credit

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I. Introduction

- Credit to GDP gap is a fundamental indicator used to identify credit bubbles.

- Currently, the indicator takes into account the aggregate credit as a ratio of GDP, without distinguishing between local and foreign currency.

- In the Albanian financial system foreign currency loans comprise about fifty percent of the total credit.

- Due to the large share of foreign currency loans, this paper evaluates the credit to GDP gap according to local and foreign currency to assess their performance in identifying credit bubbles.
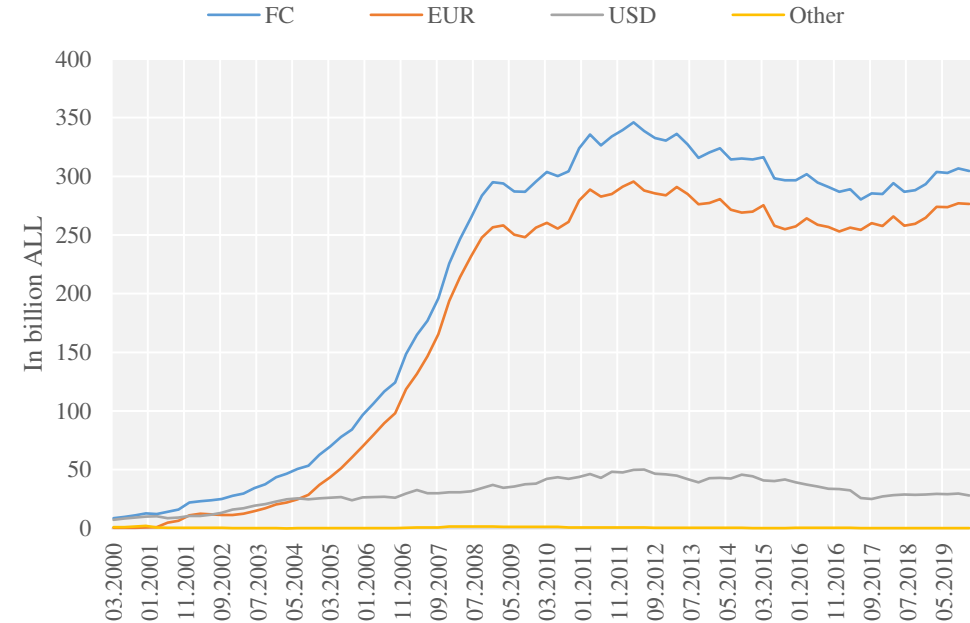
II. Albanian Credit Composition

Total private credit according to local and foreign currency in million ALL.
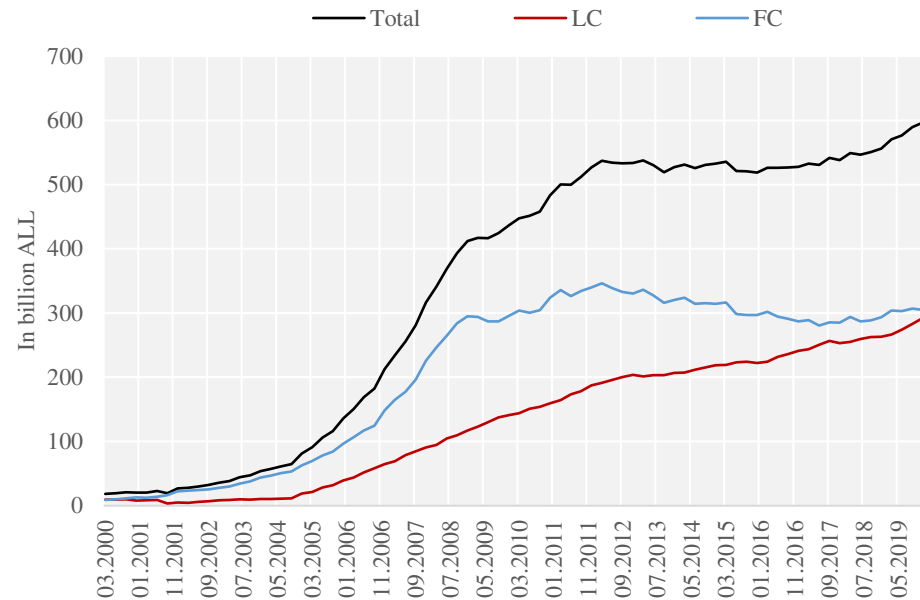
Foreign currency credit according to the main currencies in billion ALL.

III. Methodology (1) – Standard Approach

- The standard credit to GDP ratio is calculated as follows:

$$Ratio_t = \frac{Credit_t}{GDP_t} \quad (1)$$

- The trend is calculated by using a one-sided Hodrick–Prescott (HP) filter as illustrated below:

$$Trend = \min_{\{gt\}_{t=-1}^{T}} \left\{ \sum_{t=1}^{T}(y_t - g_t)^2 + \lambda \sum_{t=1}^{T}[(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2 \right\} \quad (2)$$

  where, y denotes the original time series, g refers to the trend of the time series and λ represents the positive smoothing parameter that reduces cyclicality in the trend. (Drehman et al, 2010)

- The gap between the historical value and the HP filter trend is defined as the credit to GDP gap.

$$Credit\ to\ GDP\ gap = Ratio - Trend \quad (3)$$

III. Methodology (2) – Modified Approach

- In order to extract currency exchange volatility, I follow an approach proposed by Gersl and Mitterling (2020) and calculate the level of the nominal exchange rate implied by the real exchange rate trend as follows:

$$nominal\ ER_t = \frac{100}{\exp(trend_t)} \times \frac{P_t}{P_t^*} \times \frac{1}{RER_{2010}}\ (8)$$

where, *nominal ER* represents the exchange rate after extracting the currency fluctuations at time *t*.

III. Methodology (3) – Split Currencies Approach

- In order to take into consideration, the fact that the Albanian economy uses multiple currencies I divide the standard credit to GDP gap formula into local (4) and foreign (5) currency.

$$Ratio_t^l = \frac{Credit_t^l}{GDP_t} \ (4)$$

$$Ratio_t^f = \frac{Credit_t^f}{GDP_t} \ (5)$$

- The same approach is followed to measure the credit to GDP gap according to local and foreign currency, as illustrated below:

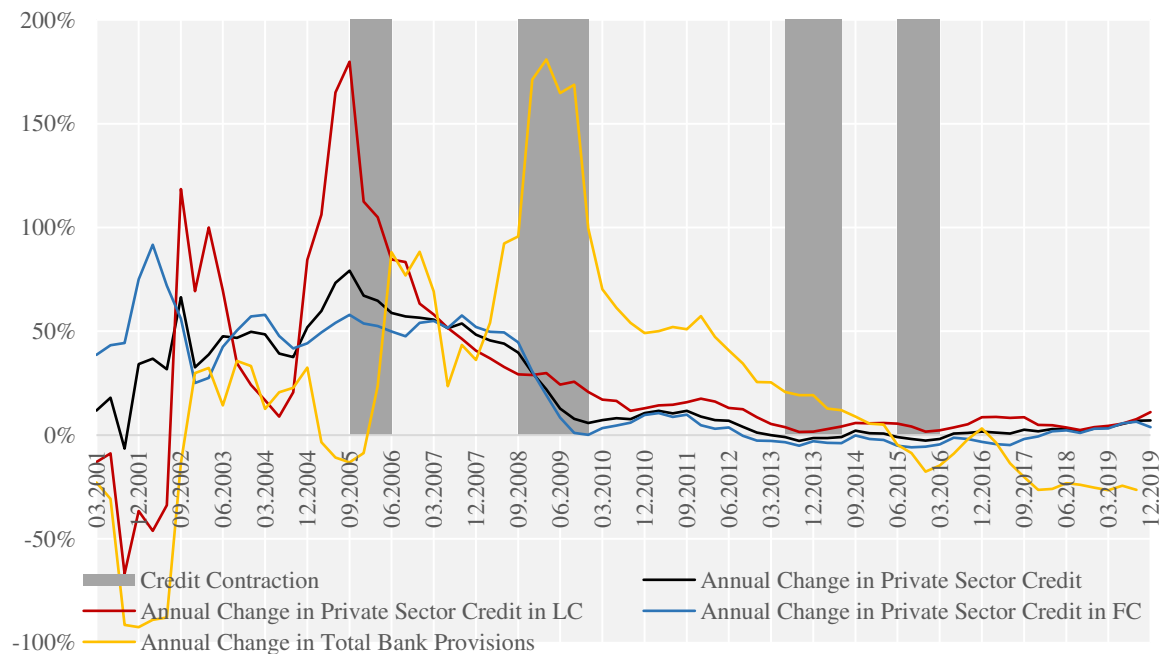$$Credit \ to \ GDP \ gap^l = Ratio^l - Trend^l \quad (6)$$

$$Credit \ to \ GDP \ gap^f = Ratio^f - Trend^f \quad (7)$$

Equations (6) and (7) allow distinguishing between a local and foreign currency gaps.

IV. Results (1)

Annual change for private credit growth, bank provisions and credit contractions.

Note: The graph provides the historical annual change for total private credit, local currency credit, foreign currency credit, and outstanding banking system provisions. I have also removed the currency exchange rate in the private credit numbers, to provide more accurate credit conditions. There are three periods of credit contractions that are highlighted with darker gray areas.

Annual change for private credit growth, bank provisions and financial crisis.
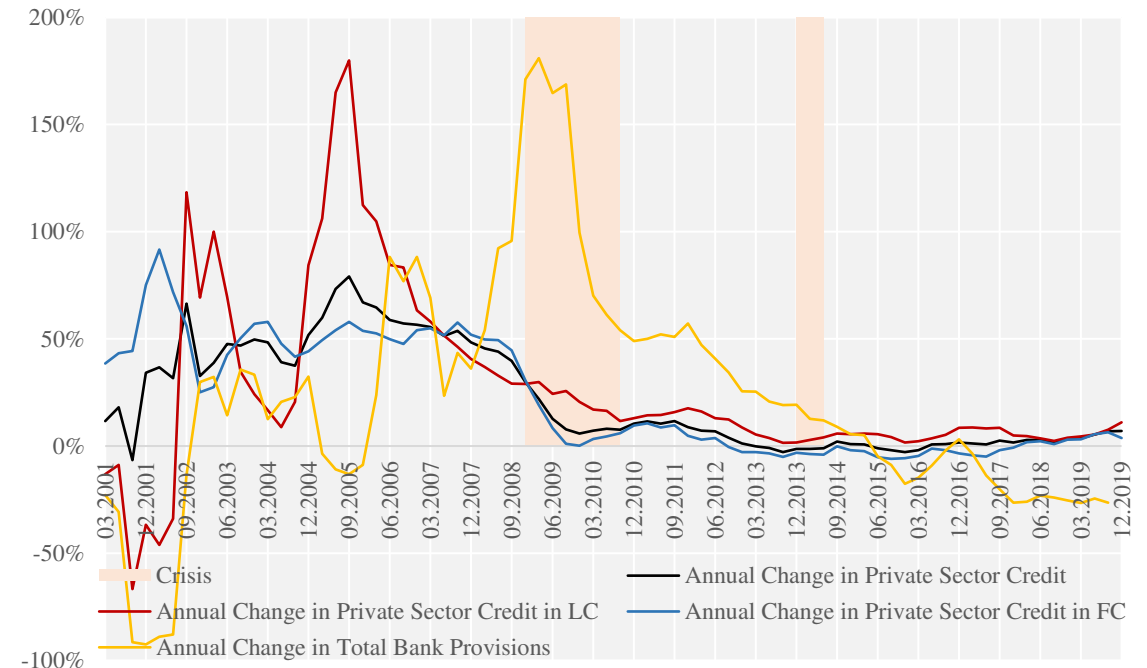
Note: The graph highlights periods defined as financial crisis. The first highlighted area, which is also the longest period, shows the crisis following the global financial crisis of the year 2008. The second crisis represents the period following the Greek debt crisis.

IV. Results (2)

AUROC results for each approach and different time lags.

| Crisis Lag	Standard Credit to GDP Gap	Modified Credit to GDP Gap	LC Credit to GDP GAP	FC Credit to GDP Gap
Crisis t-0	0.639	0.458	0.652	0.482
Crisis t-1	0.700*	0.598	0.675	0.576
Crisis t-2	0.737*	0.655	0.698	0.631
Crisis t-3	0.764*	0.709*	0.723*	0.688
Crisis t-4	0.793*	0.766*	0.767*	0.747*
Crisis t-5	0.814**	0.806**	0.816**	0.796*
Crisis t-6	0.831**	0.827**	0.869**	0.833**
Crisis t-7	0.841**	0.842**	0.897**	0.843**
Crisis t-8	**0.846****	**0.846****	**0.920*****	**0.842****

Note: The table provides AUC results according to each approach using quarterly time lags of up to eight quarters. An AUC value of more than 0.7 and up to 0.8 is considered to perform fair (*), 0.8 up to 0.9 is considered good (**), and 0.9 and above is considered excellent (***).
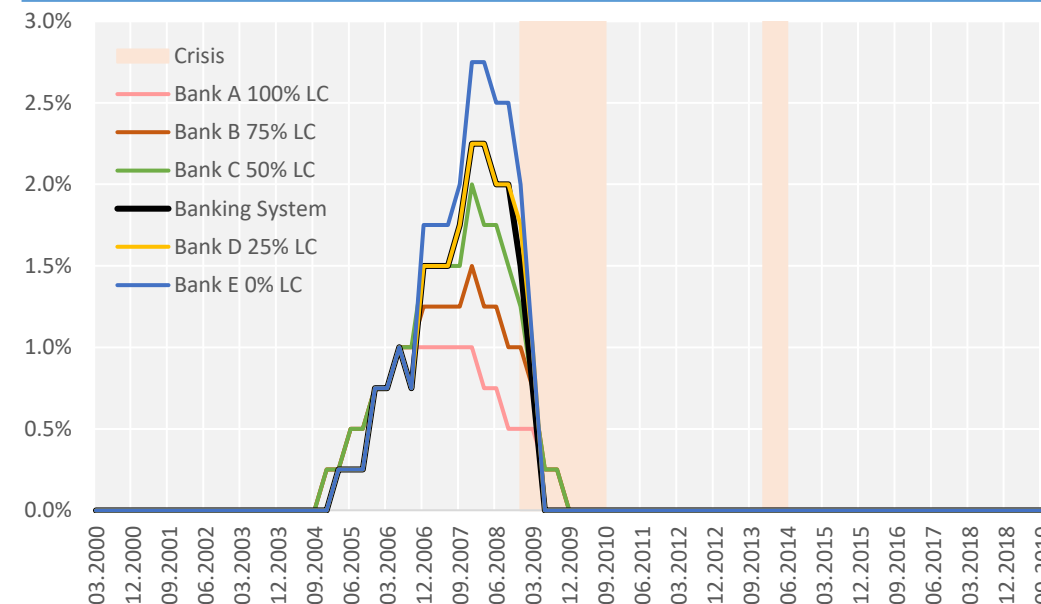
IV. Results (3)

Countercyclical buffer rate requirement according to each approach.
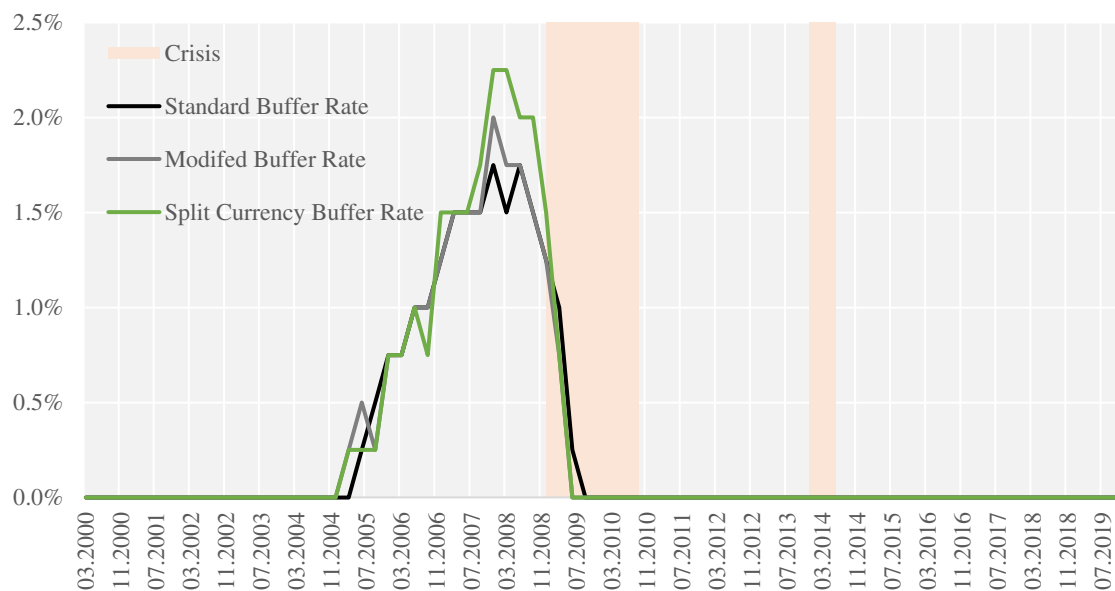
Note: The graph provides the required countercyclical capital buffer requirements according to the standard approach, the modified and the split currency approach before, during and after the financial crisis.

Examples of countercyclical capital buffer implementation.

Note: The graph provides five different examples of financial institution implementing the countercyclical capital buffer according to the split currencies approach based on their private credit currency composition.

Thank you for your time!

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