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C O N T E N T S

BANKING SOUNDNESS INDEX APPROACH AT THE LEVEL OF INDIVIDUAL BANKS

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INTRODUCTION

The recent financial crisis caused a huge cost to the world economies and despite quite substantial research and analysis, there are diverging views about the exact genesis and causes of the crisis. Some of the research analysts have attributed the accommodative monetary policy pursued in the USA during 2003-2005 as a major cause of the crisis. Lack of regulatory oversight of non-bank financial intermediaries, the so-called "shadow banks" is considered to be the major cause of genesis by another group of analysts. There are also views that the lax lending standards in the mortgage markets enabled the continuation and acceleration of the financial crisis. Some of the economists have attributed the financial crisis as a consequence of large global imbalances. Amongst all these diverse opinions and views, there is, however, unanimity that the real act of the financial crisis was enacted in the banking sector where the trigger of financial crisis initially took place. It is perceived that fragile conditions prevailing in the banking sector allowed the persistence of the crisis for a much longer period. In order to obviate the occurrence of such a crisis in future is recommended to monitor the broad issues of financial stability including banking sector stability. There are concerted efforts being made by the international organizations, such as IMF, BIS, World Bank, etc. and individual central banks, to evolve various leading indicators of financial stability, including that of the banking sector, in order to make an informed judgment about the evolving risks to the financial system and initiate corrective policy measures a priori. As banks are the vital components of any financial system, the stability of the banking sector has become a paramount policy initiative worldwide.

The issue of financial stability is tightly linked with banking stability. In fact the historical evidences demonstrate that those financial crisis which had stronger involvement of the banking sector had more devastating effect on the real sector in terms of fall in real output and reduction in employment level. The financial crisis of 2007-2008 was no exception. The theoretical analysis of the events that preceded the financial crisis prove amply that whatsoever may the origin of the financial crisis be, its trigger took place in the banking sector. There are also evidences that the financial crisis persisted for a longer period because of weaknesses in the banking sector which went unnoticed for a longer period. In view of these developments there is an additional emphasis to ensure the stability of the banking sector by strengthening regulatory norms, focusing on empirical research on the leading indicators of early warning banking stability and by preparing the banking stability map.

Banking stability is a yardstick to determine whether an economy is sufficiently strong enough to withstand both internal and external shocks. On the other side, financial stability is a by-product of stability conditions prevailing in the areas of banking, financial market and the real economy. From the above, banking stability conditions emerge as a vital ingredient to financial stability in a country. Banking stability in itself relies on the efficacies of the several parameters of individual banks, e.g.: asset quality, liquidity, capital, costs and return on assets, etc. The stability of the banking sector gets affected positively or negatively by the conditions prevailing in the financial market and the real economy. Ultimately it determines as to what extent financial stability is ensured in the economy by its ability to absorb the shocks. Stability of the banking sector is considered as a determinant of financial stability in an economy.

In view of these developments, recently central banks and other supervisory authorities have started regularly assessing the situation in the banking sector with a focus on how the sector will evolve in the medium term. Initially, the issue of the banking stability was covered under the arena of banking crisis, which was based on binary variables, which were used to determine/assess whether a banking sector is in crisis or not. But as banking crisis are rare birds, the binary variables approach are less suitable to depict the condition of the sector. However, the absence of a full-blown crisis does not mean that the banking sector would continue to be stable in the medium term. In view of the limitations of binary variable oriented models, there have been efforts to develop banking stability indicators through which banking sector stresses are easily discerned. In fact the advantages of the banking stability indicators is that they represents a continuum of stability/instability describing the banking sector condition ranging from "low level of stability", where the banking sector is predisposed to be hit by a crisis in the near future, to the "high level of stability", when the banking sector is quieter.

HISTORICAL BACKGROUND OF THE BANKING SOUNDNESS INDEX

Globally speaking, many central banks have developed or are in the process of developing various methods to identify risk factors linked with the functioning of the financial markets and the banking system. These methods and indicators are used to identify early warning signals to the policymakers to enable them to implement macro-prudential instruments a priori. IMF had included, for the first time, the Global Financial Stability Map (GFSM) in the Global Financial Stability Report (GFSR) of April 2007, and published the methodology in its Working Paper in 2010[1]. The Financial Stability Map, according to the IMF, covers six main fields: credit risk, market risk, tolerance to risk, monetary and financial issues, macro-economic risks.

Financial Stability Map was introduced as a summary tool for communicating changes in the risks and conditions affecting financial stability in a graphical

[1] *IMF Working Paper "Can you map global Financial Stability?" (June 2010)*

manner. The Map coupled with other financial supervision tools sought to create a more systematic approach towards monitoring the global financial infrastructure and to improve the understanding of risks and conditions that affect financial institutions and other intermediaries. However, the Map does not consider certain key sources of financial stability risks, like for example operational risks (IMF, June 2010).

Another attempt by IMF in this direction has been to develop a mechanism called Early Warning Exercise (EWE) to detect risks and vulnerabilities that impact financial stability. As part of the exercise, an Early Warning List (EWL) is prepared and for each risk scenario, the staff of IMF and the Financial Stability Board secretariat identify: a) policy actions to mitigate risks and reduce vulnerabilities; and b) suggestions for further analysis.

Other central banks have also tried and are still taking steps to develop their own tools and methods to spot risks and vulnerabilities that impact financial stability in their individual countries. One such attempt is the development of a tool entitled "The Index of Financial stress for Canada" by the central bank of Canada. This is a method of deriving an ordinal estimate of macro-economic financial stress in the form of an index.

Against the backdrop of this global developments, in Albania there have already been taken initiatives to develop mechanisms to mitigate risks and vulnerabilities, by preparing the Financial Stability Map, which for the first time was included in the Financial Stability Report of 2013H2. The complete paper and the relevant methodology were published for the first time in the economic journal of the Bank of Albania in 2014. Another attempt to identify the difficulties and risks that may threaten the banking sector is the development of the Banking Soundness Index through this paper. The Banking Soundness Index handles a good portion of the indicators that are covered by the Financial Stability Map as well. The indicators used in the Banking Soundness Index are very important for the assessment of the soundness of the banking sector.

THE CONSTRUCTION OF THE BANKING SOUNDNESS INDEX: METHODOLOGY

The indicator of banking soundness represent an overall assessment of the underlying conditions and inherent risk factors that affect the stability of the banking sector and that of individual banks. The indicator is composed by five sub-indexes, which represent the five dimensions of the banking system (MISHRA et.al (RBI); 2013):

I. Capital,
II. Asset-quality,
III. Profitability,
IV. Liquidity and
V. Efficiency.

Table 1 (below) presents the selected ratios to represent each dimension.

Table 1. Ratios use for the construction of the Banking Soundness Indicator.

Dimensions	Ratios			
Capital	CAR*	Tier I capital to Tier II capital*	Leverage ratio	
Asset-quality	Net NPLs / total credit	Gross NPLs / total credit	Sub-standard loans / Gross NPLs*	
Profitability	Return on Assets (ROA)*	Net interest margin *	Profit growth*	
Liquidity	Liquid assets / total assets*	Customer deposits / total assets*	Credit / Deposits	Deposits within 1 year maturity / total deposits
Efficiency	Cost to Income Ratio	(Credit + Deposits) / staff expenses *	Staff expenses / Total expenses	

** Negatively related with risk.*

Ratios are in general part of the CAMELS[2] system, which BoA's Supervision Department uses for banks' assessment and at the same time are part of the financial soundness indicators (FSI)[3]. The data for each ratio – for the five dimensions – are collected at the individual bank level.

Initially the ratios have been transformed into normal standardized variables [$z = (x_{at} - \mu)/\sigma$]. where "$X_{at}$" represents the value of each sub-division of the sub-indexes for a particular bank in a particular period of time (e.g.: the CAR value for the bank "a" in the period "t"); "μ" is the average of all the periods, of the "x" value of a particular bank; "σ"- the standard deviation. Onwards, the z values are transformed through 0 and 1 values by using the exponential transformation 1/(1+exp(Z)) and 1/(1+exp(-Z)).

For each dimension, the composed index is calculated as a simple average of the normalized ratios – in absence of the variable weights for the importance of each indicator[4].

Each sub-index (the index for each dimension) is a relative measurement for the period March 2002 – September 2016, where a high value would mean that the risk in that dimension is high. Thus, a growth in the index value, in each particular dimension, shows a growth of the risk in that dimension for that period, compared with other periods.

Furthermore, the Banking Soundness Indicator (reflected for each individual bank) is constructed as a simple average of the five composed sub-indexes drafted for the five selected dimensions.

[2] *CAMELS stands for: Capital, Asset Quality, Management, Earnings, Liquidity and Systems*
[3] *FSI (Financial Soundness Indicators) determined by the IMF for the banking soundness assessment.*
[4] *The Supervision Department does not offer importance weights for each indicator in CAMELS.*

The above calculations are automated in Excel, to reflect the soundness index for each individual bank or for each group of banks divided capital origin and size of the bank, extended in time (starting with March 2002 until September 2016). The shadowing methodology has been constructed as well in line with the performance of the index extended in time, which results in a heat map. To reflect the heat map has been used the breakdown by percentiles (10th percentile, 50th percentile, and 90th percentile).

- 10th percentile, presents those banks, which show a low risk. The value determined in the tenth percentile, shows that 10% of the calculated values of the banks have a better soundness that the value determined in the 10th percentile in our exercise.
- 50th percentile, represents the value below which are found 50% of the calculations.
- 90th percentile, represents the value above which are found 10% of the calculations. Above the value determined in the 90th percentile are included banks which are considered non very sound, i.e. that have a high exposure to risks.

- The low values of each bank index, which are in the 10th percentile and that imply low risk, are reflected in dark green.
- Values between the 10th and the 50th percentiles, which represent moderated risk, are reflected in light green to yellow.
- Average values (50th percentile) are reflected in yellow.
- Values between the 50th and the 90th percentiles are represented in orange to light red.
- While high values of the index of each bank or group of banks (90th percentile), are reflected in red. These values represent a high exposure to risk and a weak soundness.

RESULTS:

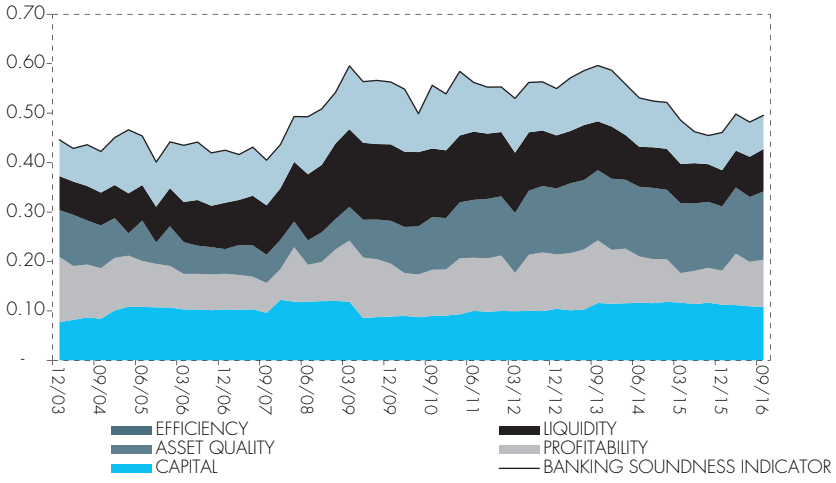
The overall performance of individual banks is shown in Figure 1, while that of the banking system in Figure 2. In Figure one the banks of the system are identified by the assets size. G1 = small banks (the assets of each of these banks do not exceed 2% of the total assets of the system); G2 = medium banks (the assets of each bank in this grouping are between 2%-7% of the assets of the system); G3 = big banks (the assets of each bank of these grouping are above 7% of the assets of the system).

Figure 1. the Banking Soundness Index, for each bank through the years.

		12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
Indeksi I Shëndetit Bankar	G3	0,47	0,48	0,49	0,41	0,43	0,49	0,49	0,47	0,48	0,54	0,62	0,54	0,55	0,65
	G1	0,50	0,38	0,43	0,47	0,47	0,54	0,57	0,69	0,56	0,50	0,50	0,40	0,48	0,49
	G1	0,48	0,49	0,56	0,54	0,46	0,46	0,52	0,53	0,49	0,51	0,45	0,49	0,45	0,53
	G3	0,43	0,48	0,46	0,49	0,47	0,51	0,60	0,52	0,54	0,57	0,57	0,53	0,45	0,48
	G2	0,42	0,49	0,51	0,49	0,45	0,48	0,50	0,46	0,55	0,59	0,56	0,52	0,50	0,48
	G1	0,44	0,48	0,45	0,43	0,39	0,41	0,47	0,45	0,50	0,56	0,57	0,56	0,61	0,54
	G3	0,31	0,52	0,63	0,57	0,54	0,53	0,54	0,58	0,58	0,47	0,54	0,50	0,46	0,48
	G2	0,39	0,47	0,38	0,45	0,45	0,53	0,59	0,57	0,52	0,61	0,60	0,54	0,47	0,48
	G2	0,32	0,41	0,38	0,44	0,50	0,56	0,57	0,57	0,62	0,53	0,53	0,58	0,55	0,46
	G2	0,41	0,43	0,37	0,45	0,52	0,58	0,56	0,57	0,57	0,53	0,50	0,52	0,49	0,49
	G2	0,47	0,47	0,36	0,39	0,46	0,50	0,50	0,56	0,62	0,59	0,57	0,60	0,49	0,57
	G1	0,45	0,45	0,43	0,46	0,49	0,62	0,54	0,55	0,54	0,52	0,53	0,52	0,49	0,47
	G1	0,45	0,48	0,46	0,53	0,48	0,47	0,55	0,48	0,50	0,53	0,51	0,49	0,51	0,46
	G3	0,49	0,40	0,42	0,50	0,49	0,45	0,52	0,54	0,50	0,53	0,56	0,53	0,52	0,50
	G2	0,45	0,52	0,43	0,44	0,45	0,57	0,61	0,54	0,50	0,51	0,51	0,52	0,49	0,53
	G2	0,50	0,48	0,48	0,52	0,46	0,48	0,48	0,49	0,45	0,52	0,50	0,52	0,52	0,53

Green = low risk and good banking soundness; yellow = moderated risk; red = high exposure to potential risks.
Source: Financial Stability Department

Chart 1 The Banking Soundness Index at the system level



The increase of the value of the indicator shows a lower stability.
The width of each dimension indicated its contribution to the risk.
Source: Bank of Albania, FSD.

The summary index of the main indicators used to track the performance and the situation of banking stability has deteriorated referring to the end of 2015 (Figure 2). The increase of the index value (which reflects an increase of risk in the first nine months of 2016) is largely affected by:

I) Weak performance of profitability: In September 2016, the banking sector net financial result decreased by around ALL 6.8 billion, year on year, at the ALL 8.6 billion level. Two banks of the system had the main influence on the decrease of the net result, which during these period report losses. The system's RoA decreased at 0.65%, from 1.2% of the previous year;

II) Liquidity: The average value of this sub-index has grown during 2016, which means risk growth and lower stability. The tightening of the main indicator of liquidity, "liquid assets / total assets", has increased its contribution to the risk of this element during the period, and

III) Degradation of asset-quality: During the first nine months of the year, the increase of non-performing loans and as a consequence the non-performing loans ratio as well, has contributed to the increase of sustainability risk of the banking sector[5]. This can be seen in Figure 2 as well, where the asset-quality is broader than the other indicators.

Historically, referring to Figure 2, the highest values of the Banking Soundness Index are recorded in 2009 and 2013. In 2009, the main influence on risk growth and the deterioration of the banking soundness was from: the continuous deterioration of liquidity, which that year constituted the main source of risk to the sustainability of the banking system; weaker efficiency of the banking system, as well as the beginning of the materialization of non-performing loans. In 2013, the low banking soundness is accompanied by the fast deterioration of asset-quality (which since 2012 until today constitutes the main source of risk to the sustainability of the banking system), as well as the decrease of banks' profit, which affects the increase of the contribution of the sub-index "profitability" to risk.

[5] *This indicator currently occupies 28% of the risk weight of the Aggregated Banking Soundness Index.*

The performance through the years of the individual banks is reflected in Figure 1 (above). At the end of September 2016 (compared with the end of 2015), the composed Banking Soundness Index shows weaker sustainability for most of the banks of the system, where the main role is being played by the big banks. Three big banks (which together constitute 57% of the total assets of the banking system) show a deterioration of the Banking Soundness Index during the year. One of them results the most exposed bank (reflected in the index in red, at 0.65) and at the same time reports the highest deterioration of the aggregate soundness index.

The banks with the lower aggregate index (represented in Figure 1 in green), which means a lower approach to risks and a better soundness of the banks are: two small and one medium bank. These banks are characterized by: high liquidity (they have the highest "liquid assets / total assets" ratios); positive performance of profitability [two of them have the highest level of return on assets (RoA), for the period].

Two banks are found in the hot zone, showing lower sustainability and high exposure to risks (one big bank and one medium with Greek capital). For both these banks, the aggregated banking soundness index has deteriorated significantly referring to the end of 2015. These banks are reflected in the index in red and carry on the values 0.57 and 0.65 each one. These banks are characterized by weak profitability during 2016. The net result and their profit have significantly decreased. One of these two banks reports losses in September 2016.

Referring to Figure 1, in the period before the global crisis of 2007, banks show a better soundness and a lower approach to risks. During 2003-2007, the majority of the banks carry on lower banking soundness index values and are represented in green. During these years, banks are characterized by high profitability, low level of non-performing loans (which translates in higher asset-quality) and are well capitalized. The global financial crisis affected Albania as well, which is reflected in the weak performance of banks during 2008-2013. During these years the banks show high levels of Banking Soundness Index, being coloured in most cases in red. During the last two years, the soundness of individual banks has improved (compared with the period before 2014), affected by: capital improvement, profitability growth, asset-quality improvement (NPR at the end of 2014 registered 15%, while currently the level of non-performing loans has decreased at 18.3%), and the improvement of banks' liquidity.

Divided in groups, according to capital origin and banks' size (Figure 3), we identify a risk growth in almost all the groupings compared with the period before the crisis (December 2007). Divided by capital origin, banks with Albanian origin have shown an improvement of the Aggregate Banking Soundness Index, referred to December 2015. Main role in this have had the improvement of the sub-indexes of "Profitability", "Liquidity" and "Efficiency". The group with "other" origin, where are included banks from other countries has a lower value of the Banking Soundness Index, which means good soundness and low risk.

Divided by size, medium banks (G2) and big banks (G3) have shown a deterioration of the index in September 2016 (compared with the end of 2015), reflecting risk growth, while small banks have shown improvement.

Figure 3 The Banking Soundness Index divided in groups by size and capital origin.

Banking Soundness Index

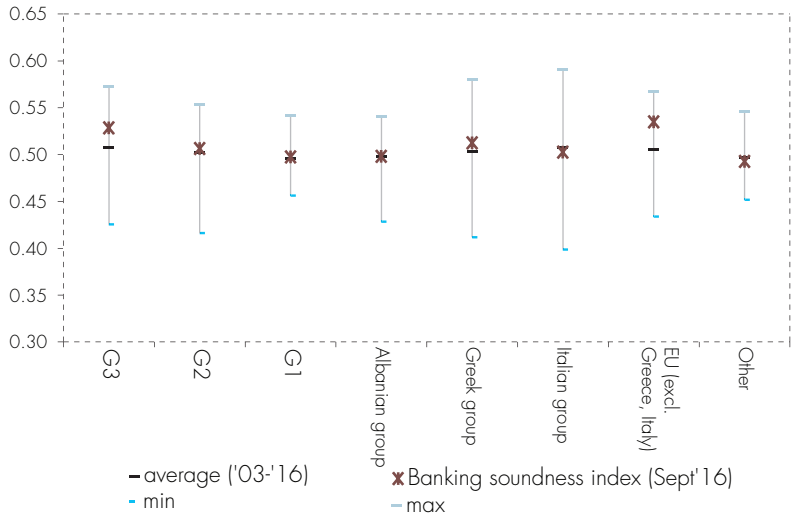
	12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
G3	0,43	0,47	0,50	0,49	0,48	0,50	0,54	0,53	0,53	0,53	0,57	0,52	0,50	0,53
G2	0,42	0,47	0,42	0,45	0,47	0,53	0,54	0,54	0,55	0,55	0,54	0,54	0,50	0,51
G1	0,46	0,46	0,47	0,49	0,46	0,50	0,53	0,54	0,52	0,52	0,51	0,49	0,51	0,50

	12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
Grupi shqiptar	0,44	0,43	0,43	0,49	0,48	0,50	0,52	0,53	0,52	0,53	0,53	0,54	0,53	0,50
Grupi grek	0,43	0,46	0,41	0,44	0,48	0,52	0,52	0,53	0,58	0,57	0,54	0,55	0,50	0,51
Grupi italian	0,40	0,50	0,59	0,56	0,50	0,49	0,53	0,56	0,53	0,49	0,50	0,49	0,46	0,50
BE (pa greqinë & italinë)	0,44	0,48	0,43	0,44	0,46	0,55	0,56	0,53	0,51	0,54	0,57	0,53	0,50	0,53
Të tjera	0,45	0,46	0,45	0,48	0,45	0,48	0,55	0,54	0,53	0,54	0,54	0,49	0,51	0,49

Source: Bank of Albania, FSD

In September 2016, the index values for the big banks (G3), and the banks with European origin (excluding Greece and Italy) show the highest level and above the historical average. This shows an increase of the exposure to potential risks in these groups (Chart 2).

Chart 2



Source: Bank of Albania, FSD.

CONCLUSIONS:

The purpose of this paper is the development of a banking soundness (stability) index for Albania. The banking soundness index is based on five parameters that offer an overview on the performance of banks and may be considered as a "precursor indicator" of various risk that may threaten the banking system overall. The movement in time of the values of the Banking Soundness Index show the performance of the banks in Albania and in the last year (December 2015 – September 2016), the symptoms of a moderated increase of unsustainability of the banking system. The unsustainability evidenced in this period has reflects the decrease of banks' profit, the slight increase of non-performing loans, as well as the deterioration of banks' liquidity. In this condition is important to highlight the need to take same preventive measures in order to improve the overall performance of the banking sector. Currently the aggregated Banking Soundness Index shows the value 0.5 (from 0.46 at the end of 2015 and 0.52 at the end of 2014). The end of 2016 shows a weaker performance referred to the end of 2015 and a better soundness of the banks compared with two years prior. In the last two years we observe a significant improvement of the efficiency of the banks, which has come as a consequence of the decrease of staff costs and the tightening of the "costs / income" ratio. At the same time we observe an improvement in the capitalization of the banks and an improvement on the non-performing loans ratio. The latter is significantly affected by the process of writing-off of loans classified as "lost" from banks' balance sheets (initiated in January 2015).

In the period after the global financial crisis (2008-2013), banking soundness overall and individual banks soundness has deteriorated significantly, compared with the period before the crisis. These years have higher values of the Aggregated Banking Soundness Index. Stability in the banking sector is a necessary condition in maintaining financial stability in general. The assets of the banking sector constitute 94% of Gross Domestic Product (GDP) of Albania. As a consequence, the deterioration of the banking soundness indicator may have a negative influence on the financial system and the real sector.

ANNEX 1

Tables of the assessment of the components of the construction of the Aggregate Banking Soundness Index.

Capital

	12/2002	12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
G3	0,45	0,46	0,55	0,60	0,49	0,47	0,45	0,42	0,42	0,45	0,46	0,58	0,62	0,60	0,56
G1	0,30	0,33	0,39	0,44	0,49	0,54	0,54	0,56	0,73	0,76	0,53	0,57	0,54	0,54	0,57
G1	0,34	0,32	0,31	0,33	0,49	0,53	0,56	0,53	0,62	0,58	0,65	0,62	0,68	0,54	0,65
G3	0,27	0,37	0,57	0,55	0,63	0,63	0,49	0,57	0,55	0,59	0,63	0,60	0,51	0,50	0,49
G2	0,50	0,53	0,61	0,73	0,67	0,48	0,40	0,41	0,49	0,45	0,52	0,59	0,51	0,39	0,42
G1	0,26	0,28	0,35	0,37	0,31	0,37	0,41	0,47	0,48	0,58	0,64	0,64	0,79	0,82	0,68
G3	0,63	0,50	0,61	0,79	0,83	0,70	0,48	0,45	0,44	0,39	0,34	0,27	0,33	0,33	0,34
G2	0,24	0,49	0,39	0,45	0,58	0,59	0,45	0,72	0,55	0,55	0,64	0,63	0,53	0,39	0,39
G2	0,16	0,20	0,22	0,34	0,57	0,59	0,53	0,61	0,61	0,69	0,60	0,61	0,68	0,71	0,65
G2	0,20	0,27	0,39	0,42	0,40	0,80	0,82	0,43	0,47	0,60	0,63	0,63	0,61	0,49	0,44
G2	0,26	0,52	0,52	0,24	0,29	0,63	0,65	0,38	0,46	0,65	0,60	0,60	0,67	0,55	0,54
G1	0,57	0,38	0,39	0,33	0,29	0,32	0,47	0,48	0,59	0,61	0,67	0,69	0,66	0,65	0,64
G1	0,63	0,38	0,50	0,57	0,54	0,56	0,52	0,45	0,42	0,38	0,44	0,49	0,54	0,59	0,48
G3	0,53	0,27	0,41	0,46	0,61	0,63	0,52	0,54	0,53	0,50	0,49	0,50	0,56	0,55	0,57
G2	0,54	0,54	0,34	0,56	0,60	0,48	0,54	0,51	0,52	0,52	0,50	0,50	0,50	0,49	0,50
G2	0,54	0,54	0,54	0,54	0,27	0,45	0,55	0,48	0,52	0,53	0,55	0,56	0,56	0,53	0,54

Profitability

	12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
G3	0,58	0,65	0,59	0,44	0,42	0,50	0,41	0,31	0,39	0,59	0,59	0,31	0,46	0,70
G1	0,57	0,22	0,34	0,42	0,41	0,55	0,56	0,82	0,48	0,51	0,65	0,37	0,47	0,45
G1	0,53	0,43	0,73	0,59	0,34	0,36	0,57	0,50	0,42	0,47	0,45	0,50	0,46	0,71
G3	0,59	0,54	0,43	0,41	0,38	0,51	0,71	0,43	0,54	0,52	0,61	0,42	0,40	0,41
G2	0,46	0,43	0,41	0,34	0,32	0,39	0,49	0,35	0,66	0,65	0,59	0,57	0,55	0,53
G1	0,36	0,35	0,39	0,40	0,32	0,47	0,54	0,47	0,66	0,66	0,50	0,59	0,76	0,57
G3	0,25	0,59	0,63	0,53	0,58	0,62	0,51	0,67	0,71	0,38	0,60	0,44	0,32	0,49
G2	0,35	0,52	0,41	0,43	0,42	0,49	0,55	0,72	0,47	0,63	0,56	0,39	0,32	0,62
G2	0,36	0,31	0,27	0,34	0,39	0,66	0,60	0,55	0,71	0,50	0,45	0,58	0,58	0,46
G2	0,49	0,41	0,24	0,35	0,39	0,52	0,68	0,61	0,65	0,55	0,41	0,46	0,46	0,51
G2	0,43	0,48	0,38	0,38	0,43	0,53	0,53	0,69	0,68	0,46	0,53	0,61	0,25	0,61
G1	0,54	0,49	0,33	0,45	0,39	0,86	0,63	0,58	0,53	0,45	0,49	0,48	0,39	0,34
G1	0,46	0,43	0,43	0,36	0,22	0,36	0,62	0,56	0,55	0,62	0,60	0,60	0,43	0,41
G3	0,62	0,36	0,47	0,50	0,55	0,31	0,44	0,56	0,37	0,48	0,62	0,51	0,49	0,34
G2	0,48	0,59	0,34	0,31	0,38	0,63	0,69	0,58	0,44	0,48	0,51	0,57	0,41	0,51
G2	0,63	0,52	0,53	0,67	0,54	0,45	0,41	0,50	0,25	0,45	0,37	0,39	0,43	0,41

Quality of assets

	12/2002	12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
G3	0,53	0,56	0,51	0,40	0,20	0,28	0,38	0,53	0,58	0,51	0,60	0,70	0,68	0,57	0,67
G1	0,44	0,44	0,23	0,25	0,29	0,45	0,46	0,43	0,72	0,67	0,74	0,67	0,52	0,52	0,46
G1	0,46	0,46	0,48	0,66	0,46	0,46	0,46	0,44	0,46	0,44	0,48	0,49	0,59	0,59	0,69
G3	0,45	0,18	0,28	0,34	0,35	0,38	0,48	0,51	0,60	0,55	0,71	0,70	0,66	0,61	0,68
G2	0,47	0,24	0,44	0,41	0,43	0,39	0,34	0,38	0,40	0,55	0,67	0,68	0,68	0,71	0,70
G1	0,45	0,42	0,70	0,51	0,56	0,38	0,35	0,36	0,37	0,64	0,63	0,64	0,47	0,47	0,56
G3	0,46	0,33	0,23	0,46	0,26	0,35	0,38	0,44	0,60	0,72	0,74	0,77	0,73	0,66	0,60
G2	0,44	0,36	0,34	0,37	0,54	0,44	0,36	0,33	0,40	0,48	0,69	0,73	0,72	0,65	0,68
G2	0,42	0,28	0,43	0,21	0,24	0,36	0,41	0,56	0,57	0,67	0,69	0,68	0,77	0,60	0,56
G2	0,27	0,30	0,42	0,25	0,30	0,28	0,38	0,55	0,59	0,72	0,70	0,71	0,73	0,58	0,62
G2	0,26	0,46	0,46	0,45	0,46	0,45	0,31	0,34	0,46	0,68	0,72	0,69	0,65	0,64	0,61
G1	0,41	0,43	0,41	0,42	0,46	0,48	0,40	0,52	0,49	0,51	0,48	0,56	0,64	0,71	0,71
G1	0,44	0,44	0,44	0,44	0,79	0,65	0,51	0,58	0,44	0,44	0,44	0,44	0,44	0,44	0,44
G3	0,45	0,45	0,24	0,30	0,47	0,31	0,32	0,51	0,55	0,54	0,59	0,60	0,69	0,71	0,74
G2	0,39	0,39	0,39	0,22	0,37	0,53	0,66	0,67	0,68	0,52	0,54	0,51	0,55	0,54	0,57
G2	0,45	0,45	0,45	0,45	0,45	0,24	0,33	0,41	0,48	0,51	0,61	0,63	0,72	0,69	0,70

liquidity

	12/2002	12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
G3	0,38	0,35	0,27	0,33	0,36	0,40	0,59	0,68	0,67	0,67	0,55	0,65	0,58	0,56	0,67
G1	0,49	0,53	0,55	0,62	0,62	0,52	0,64	0,66	0,53	0,58	0,38	0,32	0,28	0,44	0,50
G1	0,48	0,42	0,63	0,48	0,64	0,59	0,56	0,56	0,57	0,52	0,52	0,28	0,34	0,34	0,28
G3	0,34	0,38	0,40	0,43	0,46	0,47	0,57	0,64	0,60	0,63	0,63	0,55	0,52	0,47	0,57
G2	0,28	0,28	0,36	0,42	0,42	0,60	0,82	0,83	0,69	0,67	0,68	0,43	0,40	0,36	0,31
G1	0,78	0,70	0,68	0,70	0,43	0,34	0,56	0,53	0,47	0,36	0,31	0,43	0,41	0,45	0,38
G3	0,18	0,31	0,50	0,56	0,63	0,57	0,68	0,72	0,59	0,61	0,42	0,59	0,48	0,48	0,47
G2	0,32	0,25	0,48	0,38	0,36	0,42	0,63	0,61	0,59	0,70	0,61	0,59	0,65	0,72	0,51
G2	0,49	0,44	0,40	0,52	0,62	0,68	0,75	0,74	0,69	0,53	0,44	0,39	0,30	0,21	0,12
G2	0,34	0,35	0,44	0,60	0,69	0,71	0,74	0,66	0,66	0,50	0,34	0,32	0,31	0,38	0,30
G2	0,56	0,56	0,44	0,46	0,53	0,53	0,63	0,69	0,64	0,51	0,51	0,32	0,31	0,32	0,35
G1	0,44	0,48	0,55	0,50	0,48	0,62	0,68	0,52	0,56	0,56	0,54	0,46	0,44	0,31	0,29
G1	0,49	0,31	0,44	0,42	0,38	0,55	0,56	0,56	0,47	0,61	0,68	0,53	0,52	0,47	0,51
G3	0,50	0,42	0,43	0,40	0,44	0,45	0,56	0,56	0,55	0,62	0,62	0,60	0,47	0,48	0,48
G2	0,49	0,49	0,62	0,49	0,40	0,38	0,44	0,50	0,39	0,52	0,57	0,58	0,55	0,60	0,66
G2	0,47	0,47	0,47	0,47	0,46	0,47	0,53	0,58	0,45	0,50	0,49	0,47	0,49	0,52	0,55

Efficency

	12/2002	12/2003	12/2004	12/2005	12/2006	12/2007	12/2008	12/2009	12/2010	12/2011	12/2012	12/2013	12/2014	12/2015	09/2016
G3	0,79	0,41	0,43	0,53	0,57	0,59	0,54	0,40	0,38	0,41	0,51	0,60	0,49	0,57	0,67
G1	0,53	0,63	0,52	0,50	0,52	0,45	0,50	0,61	0,66	0,32	0,34	0,30	0,29	0,43	0,47
G1	0,67	0,70	0,59	0,58	0,50	0,40	0,35	0,49	0,51	0,47	0,44	0,42	0,32	0,30	0,32
G3	0,42	0,62	0,61	0,57	0,59	0,48	0,48	0,57	0,44	0,38	0,35	0,37	0,53	0,30	0,26
G2	0,65	0,58	0,61	0,58	0,60	0,48	0,45	0,39	0,35	0,41	0,42	0,50	0,44	0,48	0,46
G1	0,61	0,46	0,33	0,29	0,43	0,53	0,24	0,43	0,44	0,28	0,56	0,62	0,52	0,54	0,49
G3	0,22	0,17	0,67	0,69	0,62	0,50	0,50	0,58	0,60	0,48	0,47	0,48	0,51	0,54	0,49
G2	0,47	0,50	0,64	0,30	0,31	0,37	0,71	0,75	0,62	0,42	0,47	0,51	0,43	0,27	0,22
G2	0,26	0,31	0,69	0,55	0,42	0,48	0,45	0,33	0,40	0,49	0,44	0,55	0,55	0,63	0,53
G2	0,57	0,63	0,50	0,32	0,51	0,43	0,45	0,51	0,53	0,40	0,42	0,42	0,47	0,55	0,56
G2	0,41	0,38	0,44	0,25	0,31	0,27	0,39	0,54	0,55	0,57	0,64	0,71	0,78	0,70	0,74
G1	0,34	0,42	0,43	0,58	0,62	0,62	0,67	0,54	0,54	0,48	0,46	0,44	0,40	0,41	0,38
G1	0,46	0,67	0,59	0,45	0,59	0,41	0,42	0,54	0,54	0,51	0,48	0,49	0,33	0,63	0,46
G3	0,44	0,68	0,55	0,49	0,47	0,51	0,54	0,57	0,51	0,47	0,48	0,46	0,40	0,36	0,39
G2	0,36	0,36	0,65	0,55	0,51	0,50	0,59	0,66	0,55	0,49	0,46	0,45	0,42	0,41	0,41
G2	0,43	0,43	0,43	0,43	0,76	0,62	0,54	0,50	0,47	0,48	0,47	0,45	0,45	0,44	0,45

Source: Bank of Albania, FSD

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IMPLICATIONS OF THE LEVEL OF THE CURRENCY MISMATCH IN THE BANKING ACTIVITY

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1. INTRODUCTION

The phenomenon of borrowing in foreign currency, driven by an economy with a high euroization has been a significant concern, especially recently in developing countries including Albania[1]. As a result of relatively easy access to sources of financing in foreign currency and low risk, commercial banks were not inclined to give priority to loans in domestic currency.

On the other hand, borrowers in these countries, driven by lower interest rates and longer maturity periods compared to lending in domestic currency and limited financial education conditions expanded the exposure in foreign currency. In the case of households the risk is extremely high because unlike businesses, households are more exposed to the adverse effects of exchange rate, given the fact that their income is not in the same currency as the loan. The lack of alternative markets also plays a role in emphasizing the phenomenon. Consequently, a substantial devaluation of the exchange rate may make it harder to repay loans in these currencies.

Currency mismatch is the extent to which the assets are in a currency other than that of the liabilities and where a fluctuation in the exchange rate could have either a positive or negative impact, on net terms. Consequently currency mismatch is among the creating mechanisms of systemic risk in emerging economies. Previous studies have shown that despite this, the banks have been cautious to keep higher levels of foreign currency assets relative to the volume of liabilities in foreign currency, thus creating a natural hedge against this risk. After the recent financial crisis, the risk is also intended to be addressed by regulators with macro-prudential measures package, through the process of reducing financial leverage at the expense of economic growth inhibition.

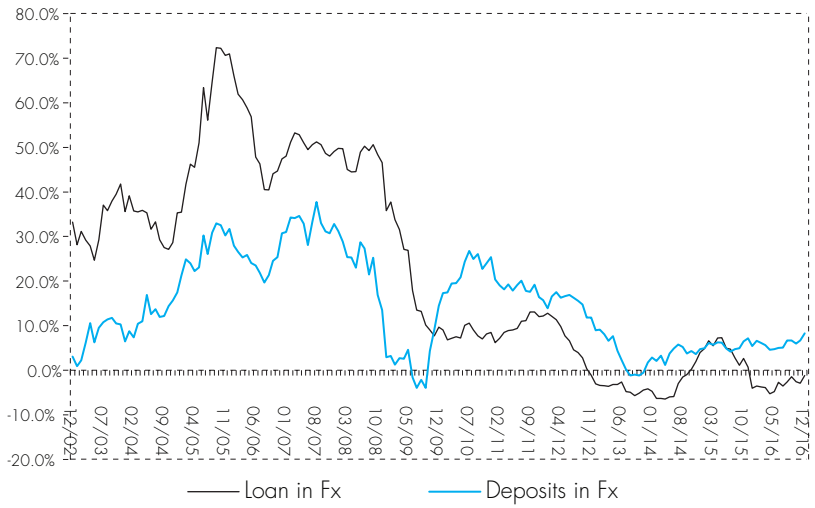
In many countries that are not part of the eurozone, lending in foreign currency to total loans remains high -44% for Bulgaria (April 2016)[2] , 49% for Romania (December 2015)[3], 64.9% for Croatia (March 2016)[4] and Serbia 67.9% (September 2016)[5]. Meanwhile, lending in Swiss franc in countries of the eurozone held a high weight to total loans as in Austria with 14.8% (2016).[6]

[1] *Usage of the US dollar and especially Swiss Franc in Eastern European countries outside the eurozone is a phenomenon.*
[2] *Bank of Bulgaria, official website, data of banking supervision, April 2016.*
[3] *International Bank of Romania "Financial Stability Report", April 2016.*
[4] *Croatian National Bank "Financial Stability Report" July 2016.*
[5] *National Bank of Serbia, "Quarterly report on indicators' developments of financial soundness 2016 Q3", December 2016*
[6] *National Bank of Austria, "Financial Stability Report", December 2016.*

Policy-making institutions have continuously highlighted this concern. One of the measures for addressing this risk to countries of the eurozone is the official recommendation that is issued by the European Systemic Risk Board (ESRB) in November 2011, for the slowdown of lending in foreign currency to borrowers that are unhedged from the exchange rate in some EU countries to prevent the spread of systemic risk.

In the case of Albania, borrowing in foreign currency, accounts about 58.6% of the total loan, thus representing a potential source of systemic risk. Before the global financial crisis (before 2008), the growth rate of foreign currency loans was higher than the growth rate of financing in foreign currency. As shown in Chart 1, after 2008, foreign currency deposits show a higher growth rate affected by credit contraction in foreign currency after the crises. In this context, it is essential to deeply analyse the indicators that reflect the bank exposure to currency mismatches represented by an index that measures the exposure degree of this mismatch.

Chart 1 Annual growth of loans and foreign currency deposits



Source: Bank of Albania

This material is structured as follows: the two next sections describe the database and the methodology chosen for the index construction followed by the results obtained from the exercise and conclusions, tables and charts at the end of this material.

2. DATA DESCRIPTION

The data used in this material are taken from the financial statement sheets of individual banks in panel and for the total sector. This database is rich in terms of data coverage, detailing and frequency and is used to calculate the index of mismatches at sector level, for groups by size of activity and currency (Lek, Euro, US dollar and other). The frequency enables tracking of developments at an early stage in order to identify in time the negative effects stemming from unfavourable fluctuations in the exchange rate. The quarterly data extent from 2007 Q1 until 2016 Q4. Data used for the construction of the index are:

a) Total assets
b) Assets and liabilities in foreign currency
c) Resident loan in foreign currency
d) Unhedged loan to households
e) Unhedged loan to businesses

3. METHODOLOGY

The literature used, promotes the increase of research activity as aggregated indicators alone are not able to evaluate the degree of risk extension (IMF 2010). Aiming to identify the risk arising from fluctuations of the exchange rate, at a granular level, we have chosen to follow the approach initially suggested by Ranciere, Tornell and Vamvakidis (2010) and then implemented by Yesin (2013) whose focus was systemic banks. In our case, firstly is calculated the index at sector level for groups by asset size and currency (euro, US dollar and other. Formula (1) calculates the foreign currency mismatch index as follows:
Foreign currency mismatch Index (foreign currency level) =

$$\frac{\textit{Liabilities in Fx - (Assets in Fx - Resident Loans in Fx)}}{\textit{Total Assets}} \quad (1)$$

The main above index, deducts the foreign currency assets with resident loans in foreign currency, considering the latter to be potentially vulnerable. The higher the index value of foreign currency mismatch, the higher the risk exposure.

Banks are likely to protect themselves from the foreign exchange activity by creating asset surplus against liabilities in foreign currency. To estimate this surplus in relation to total assets, a second index is calculated (as a sum of three sub-indices at currency level- euro, usd and other currencies) according to the following formula:

$$\frac{\textit{(Assets in Fx - Liabilities in Fx)- (Unhedged Loans in Fx Households+Businesses)}}{\textit{Total Assets}} \quad (2)$$

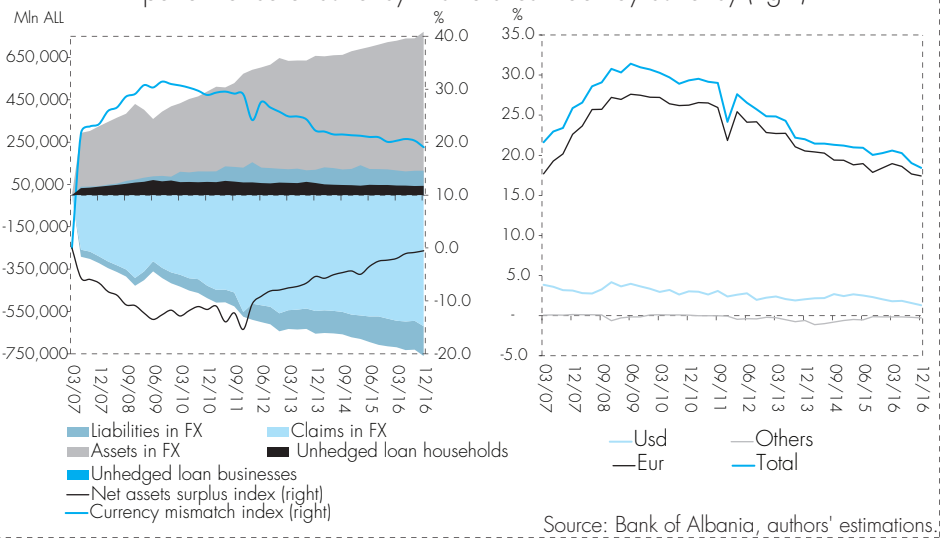
When calculating this index, the unhedged loans to enterprises and households are deducted, although households have the highest risk. For banking sector,

unhedged loan is almost at 26.6% of the total loan and 45.3% of the foreign currency loan. The ratio of non-performing loans in this portfolio is 19.3% for 2016 Q4. To households is 11.2% whilst to businesses is 22.2%. In case of a significant depreciation of the domestic currency, borrowers of the category "business", become more vulnerable regarding the return of their debt in foreign currency. The higher the index value of the net assets surplus, the lower the risk exposure.

4. RESULTS

The implementation of this exercise highlights the impact of unhedged loan to households and businesses in the performance of the currency mismatch. To protect themselves from exposures in foreign currency, banks tend to hold high surplus created in assets compared to liabilities in foreign currency. The currency mismatch expands in periods during which the unhedged loan from the exchange rate is high. The same applies for the index of net asset surplus but with an opposite sign. Closer to the zero the performance of two indices, less exposed is the banking sector to fluctuations of the exchange rate (Chart 2, left). By the end of 2016 indices improved compared with a year ago. Concretely, the currency mismatch index fell to 18.4% at the end of 2016 from 20.3% a year ago. The index of net asset surplus rose to -0.62% from -0.96% a year ago (Chart 2, left). This performance was driven by the increase of foreign currency assets (by 8.5% yoy) and decline in lending in foreign currency to residents by -0.3% (yoy) On the other hand, a higher decline of unhedged loans to households (-7.3% yoy) contributed significantly to the improvement of the index of net asset balance.

Chart 2 The performance of the index components for the banking sector (left) and performance of currency mismatches index by currency (right)

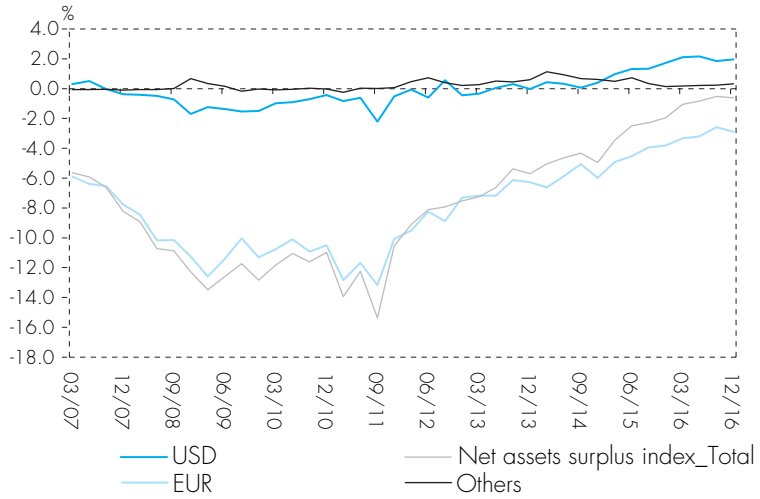


Source: Bank of Albania, authors' estimations.

At the sector level, the index of currency mismatch rapidly grew during 2007-2009, mainly due to the mismatch in the European currency and after this period it started to fall. The index of the European currency is 17.4% at the

end of the period compared to 18.4% a year ago. The index of the US dollar represents more sustainable levels but slightly declines at the end of 2016 down to 1.3%, whilst the index for all the other currencies is non-material and furthermore, at certain periods it records negative values (Chart 2, right). In regard to the index of net asset surplus, it is noted that the banking sector is mostly exposed to the fluctuations of the exchange rate, mainly during 2011 Q3 (chart 3), (the highest negative value, -15.4%) gradually improving over the coming years. In the index development, these developments are driven by the European currency and less by the US dollar and other currencies.

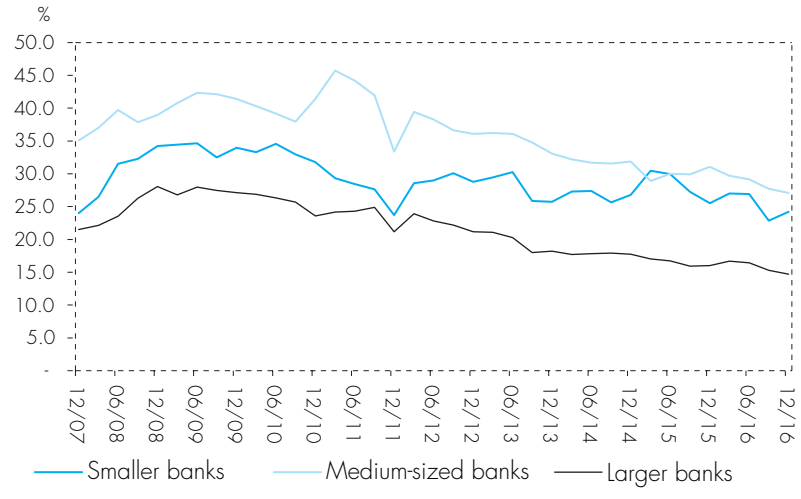
Chart 3 Index performance of net asset balance by currency



Source: Bank of Albania, authors' estimations.

By the end of 2016, the indices of currency mismatch for groups by activity size, recorded the lowest value of the entire period under review, indicating a lower exposure to exchange rate risk.

Chart 4. Index performance of currency mismatch for groups by size of activity.

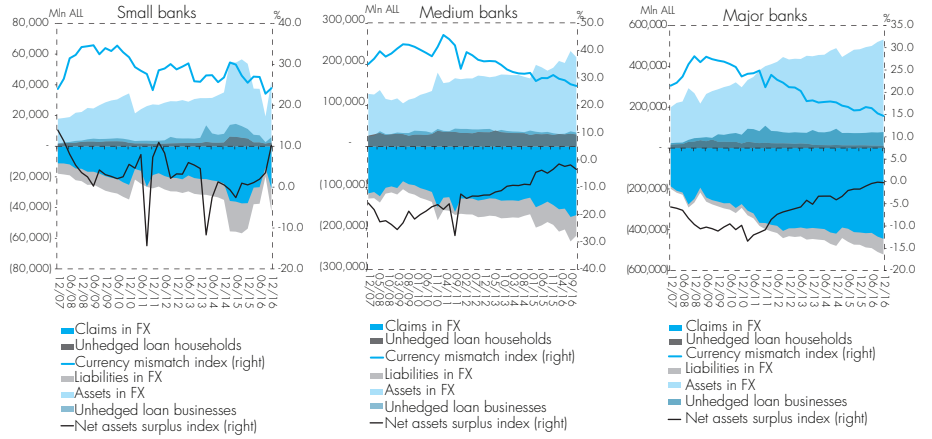


Source: Bank of Albania, authors' estimations.

The group of big banks represents the best performance of these indices, where the index of currency mismatch declined and at the same time the index of net asset balance gets close to 0. (chart 5). This improvement was mainly a result of reduced unhedged lending to households by 13.8% compared with a year ago. Regarding the group of small banks, they represent an improvement of both indices, mainly as a result of the decline of unhedged loan to households (-52.6%) and businesses (-47.9%) in annual terms.

Medium-sized banks represent an improvement of the currency mismatch index (from 31.9% to 27.1%). At the same time, there is also a slight deterioration of the index of net asset balance which increased by 0.4% as a result of the slight increase of unhedged loans to households (by 3.8%) and businesses (by 5.7%)

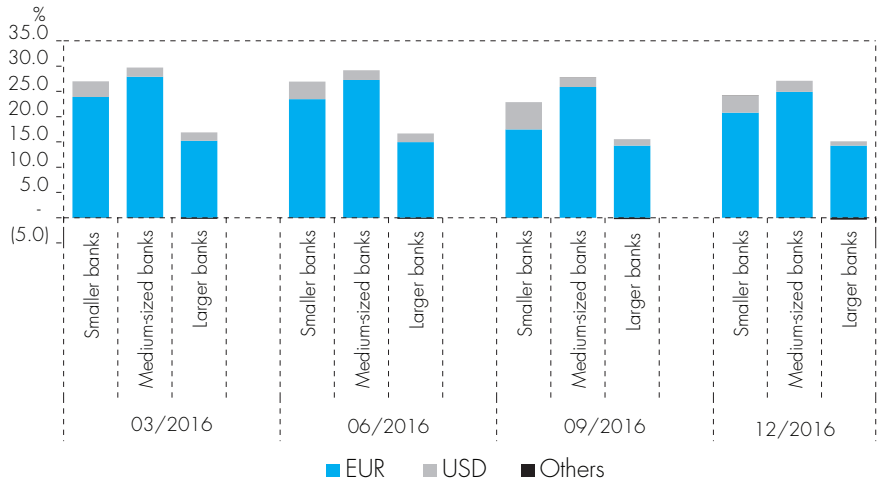
Chart 5. Performance of the index components for groups by activity size.



Source: Bank of Albania, authors' estimations.

By currency, all three groups of banks exhibit high exposure to European currency, the performance of which dictates the developments in the indices of currency mismatch. In comparison with other groups, during 2016, medium-sized banks show a higher risk level against the European currency, although this risk remained unchanged during all quarters of 2016. Big banks are less exposed to exchange rate fluctuations (chart 6).

Chart 6. Performance of currency mismatch index for banking groups by currency.



Source: Bank of Albania, authors' estimations.

5. CONCLUSIONS

Foreign currency loans granted to borrowers, the income of whose is in different currency from the currency of the debt service, is a source of danger in case of local currency depreciation. The probability of this risk occurrence would affect the entire banking sector, contributing to the accumulation of the systemic risk. This analysis' estimations highlight the extent of our sector's exposure to indirect risk of loans, even in cases when they are hedged against the exchange rate risk.

The index of the currency mismatch and the net assets surplus serve not only to measure the direct risk stemming from the creation of liabilities in foreign currency to a greater extent compared to foreign currency assets, but simultaneously also for the measurement of indirect exposure stemming from the foreign currency lending, in terms when the borrowers' income are in domestic currency.

The Albanian banking sector is relatively hedged from the unfavourable fluctuations of the exchange rate, as banks own more foreign currency assets than foreign currency liabilities, thus creating a natural hedge against direct risk of exchange rate.

At bank groups, large banks display the lowest level of exposure in total and by currency, while medium-sized banks have the highest exposure, although steady over time.

Various studies show that currently these two indices define the risk trend depending on the values calculated according to the methodology (low/high values), but do not define a ceiling or floor level, for the highest and lowest values of these indices. Such levels may be the focus of future research.

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THE TRANSMISSION OF IMPORT PRICES TO PRODUCER PRICES IN THE CASE OF ALBANIA

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This paper addresses the issue of import price transmission to domestic producer prices. The purpose is to take account of this additional channel to complement the existing literature on Albania and also to propose a potential new channel to be incorporated into the future larger MEAM model. The model is based on a VECM approach in order to check the long-term relationship and also short-term influences of import prices on domestic producer prices. Additionally, the model introduces mechanisms to take into account for the presence of asymmetry in the short-term relationship. The presence of asymmetry in the long-term relationship is also scrutinized.

Keywords: import prices, producer prices, VECM approach, asymmetries.
JEL classification: B23, D82, L16.

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1. INTRODUCTION

The issue of international import prices being transmitted to domestic prices represents a hot topic in particular amongst small open economies such as Albania. In particular, transmissions towards consumer goods have attracted a high degree of attention considering the sensitivity that inflation bears in terms of real economy and economic policy developments. Inflation associated effects seem to reflect the conditions in larger economies as well.

On the other hand, a category that has received less attention in the past but is making up in recent studies is associated with producer prices. Indeed, even higher dependencies on internationally traded commodities like fuel, metals, non-metal raw materials represent an additional channel of foreign price pass through. Price chain models have been developed to incorporate foreign prices and domestic consumer and producer prices (and possibly exchange rate as well) in one main framework (MacCarthy, 2000). Additionally, issues associated with asymmetries in long and short term have captured the spotlight producing more complicated methodologies to deal with the issues.

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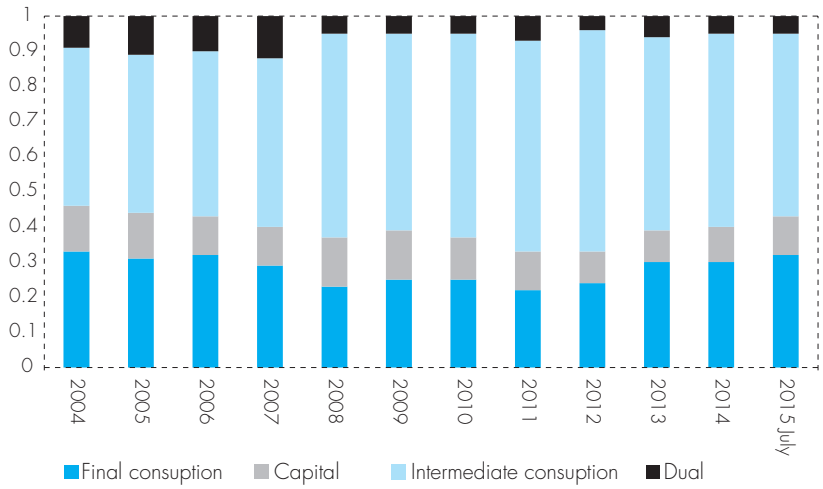
In the case of Albania, price transmission research works have been mostly associated with consumer prices, starting from international prices or exchange rates. Evidence from econometrical frameworks has revealed the existence of a pass-through in the case of tradable goods from international prices (Celiku, 2003), and in the case of exchange rate (Tanku, Vika, & Gjermeni, 2007). However, more recent studies have produced a different picture on the issue. Skufi & Cela (2013) apply an accounting decomposition of main CPI basket items to differentiate between domestic and foreign impacts. The results indicate the dominance of domestic influences over foreign one in regard to individual items and also in overall terms. Additionally, in the process of re-estimating the macroeconomic model of Albania (Vika et al., 2015) , the equation featuring consumer price index was re-evaluated using longer time series for all dependent and explanatory variables including import prices. Results from vector error correction optimizations have shown a poor co-integration relationship between these two variables with a small error correction term and also a comparatively small long-term coefficient. Based on these findings we propose an additional approach to the issue.

Price transmission towards producer prices is generally disregarded in the case of Albania. Higher emphasis towards consumer prices and data issues related to producer prices, have been partly the reason behind the neglect. However, we have a reason to believe that import prices are also transmitted via this channel. This belief is based on the composition of commodity imports based according to broad economic categories. The de-composition emphasizing consumer goods, capital goods, intermediate goods and dual categories are shown in the following table:

Chart 1 Import by broad economic categories (% on overall goods'imports)



Source: INSTAT and author's calculations.

According to table 1, we can confirm that intermediate goods (going for intermediate consumption) represent the bulk of commodity imports with consumer goods lagging far behind them in terms of contribution. Indeed, the

Albanian economy is highly dependent not only on imported fuels, but also on metal and non-metal raw materials.

Another important aspect that remains omitted in the Albanian literature concerns transmission asymmetries. As we will explore in the literature review section, modelling of asymmetries (or non-linearities) represents a common practice in price transmission literature. Also, asymmetries are addressed at different layers related to thresholds, moments and regimes both in short and long term.

This paper addresses the issue of import price transmission to domestic producer prices. The purpose is to take account of this additional channel to complement the existing literature on Albania, also to propose a potential new channel to be incorporated into the future larger MEAM model. Based on existing literature and the general structure of MEAM we have decided to stick to the VEC approach in order to check the long-term relationship and also short-term influences of import prices on domestic producer prices. Additionally, the model introduces the mechanisms to take into account for the presence of asymmetry in the short term relationship. The presence of asymmetry in the long-term relationship is also scrutinized.

According to the results, we find a long-run co-integration relationship between the two variables suggesting the presence of such pass-through. In regard to asymmetries, short-term coefficients suggest the presence of such phenomenon. As for the long-term relationship, BDS test statistics do not reject the existence of a linear relationship.

2. LITERATURE ON PRICE TRANSMISSION

The history of literature related to price transmission goes back to the 1950s. In the early stages, the investigations would deal primarily with single commodities to which the consumer was generally sensitive like gasoline, alimentary, agriculture (Frey & Manera, 2005). The general framework was constructed around price-chain models running from upstream to downstream and including input, wholesale and retail prices. In the latter stages, literature would also focus on composite price index including: import prices, general wholesale prices, producer prices and of course consumer prices.

Apart from the general interest of determining the existence of transmission between prices, a special emphasis has followed the developments associated with asymmetries. Unlike economic theory which only trivially connects with asymmetries, empirical literature is most ample in regard to dealing with the issue. Indeed, in their review of econometric models associated with price transmission, Frey & Manera (2005) reveal that only 11 out of 69 contributions report no such events. Throughout the five decades of price transmission and asymmetry analysis, not only have the models evolved, but so have the concepts and definitions of asymmetry.

There are two general types of asymmetry: short-term and long-term. In the short-term, asymmetry is a matter of different reaction of downstream prices (output, retail or consumer prices) for positive/negative changes of upstream prices (input, wholesale prices or import). On the other hand, long-term asymmetries are related primarily to length of reaction and also adjustment towards the general equilibrium. Within the major categories there exist also sub-categories of asymmetries.

Contemporaneous impact, distributed lag effects and cumulated effects are primarily associated with short-term asymmetries (Frey & Manera, 2005). On the other hand, reaction time, equilibrium adjustment path and momentum equilibrium path are related to long-term asymmetries. Also, in the long-term group fall the types of asymmetry that are associated with regime shifting (regime effect and regime equilibrium adjustment).

Considering the various types of asymmetries, there is also a large array of models that attempt to capture or test the presence of them. The earlier models adopted the autoregressive distributed lag approach (ARDL) which is able to capture mainly short-term asymmetries (contemporaneous effects, distributed lag and cumulative impacts). A clear advantage with ARDL is the ability to deal with the presence of both stationary and non-stationary (at level) data. The majority of examples incorporating such technique are mainly concerned with the United States. Kinnucan & Foker (1987) apply the model to the case of alimentary products in the US using monthly data. They reveal the presence of all three kinds of asymmetries. Furthermore, a large array of studies focuses on the gasoline market (Shin, 1994; Duffy-Deno, 1996). In all cases, the presence of short-term asymmetries in transmission is reported with statistical significance. In regard to agricultural products, asymmetries are also reported in the case of US (Powers, 1995; Zhang, Fletcher, & Carley, 1995), Brazil (Aguiar & Santana, 2002), the Netherlands (Bunte & Zachariasse, 2003) and also in the case of multiple countries (Moharty, Peterson, & Kruse, 1995).

The partial adjustment models (PAM) determine the adjustment process from deviations from target which can range between immediate and infinite. The model can incorporate asymmetries in terms of defining the adjustment process to whether the subject variable lies above or below target. Empirical literature applying PAM is quiet limited and focuses almost entirely in the case of gasoline prices in the US (Shin, 1994; Salas, 2002) and UK (Bacon, 1991).

The models mentioned previously have the tendency to produce spurious results in the presence of non-stationary and co-integrated data. Error correction estimations are suggested in this case (Manning, 1991). In the general error correction framework, intercept dummies are introduced to take into account for direct impact asymmetries. Additionally, Error Correction Models can deal with asymmetries at adjustment level (von Cramon-Taubadel & Meyer, 2004).

Error correction approach is widely applied in more recent empirical contributions and has covered various categories of prices. Contin, Correlj,

& Palacios (2004) apply the technique in case of gasoline prices in Spain employing weekly data. Krivonos (2004) conduct a similar analysis on monthly data for African countries dividing the time sample into two periods. Asymmetries are not found in the period 1984-1990, however they are reported in the following time frame (1990-2003). Several studies place emphasis on asymmetries in the case of gasoline prices for European countries (Grasso & Manera, 2005) and the United States (Radchenko, 2005).

Another category of empirical studies that is growing in importance in recent literature deals with regime switching behavior of transmission. These studies emphasize that the relationship also depends on the state of the explanatory variable. The states are unobservable from a specification point of view but can affect the nature of the relationship (between regimes). Regime switching models are most common in the case of US (Johnson, 2002) and European gasoline prices (Grasso & Manera, 2005). Powers (1995) applies such model in the case of US agricultural prices whilst Goodwin & Holt (1999) concentrate on US alimentary products. In all examples, the authors find the presence of asymmetry of some kind.

The approaches mentioned so far represent univariate methodologies. Nevertheless, empirical contributions also include the multivariate approaches which follow the same theoretical background as the univariate methods but include the additional dimension to the analysis. Naturally, the most common practice in this case is the application of Vector Autoregressive models. The approach is applied by Capps (1993) in the case of US alimentary products and also Miller & Hayenga (2001) in the case of UK alimentary products. Willett, Hansmire, & Bernard (1997) on the other hand, concentrate on US agricultural products.

Vector Error Correction model approaches are also quiet popular in the empirical literature. Kirchgassner & Kubler (1992) analyze the gasoline market in Germany while Chavas & Mehta (2004) apply this methodology on US alimentary products. Another example arrives from the wheat agro-chain in the Czech Republic (Rumankova, 2014). Finally, Vector Error Switching models are applied in the case of the Spanish gasoline market (Goodwin and Serra, 2003) and the Finish alimentary (Luoma, Luoto, & Taipale, 2004).

3. DATA AND METHODOLOGY

As mentioned in the introductory section, the purpose of the analysis is to determine the existence of a transmission process between import prices and producer prices. The two respective variables included in the model are the producer price index (PPI) and the unit value of imports price index (UVI). Both statistics are provided from the National Institute of Statistics (INSTAT) (unit value of imports index). Both indices are constructed using data expressed in domestic currency. That is particularly important in the case of the UVI index as exchange rate fluctuations are reflected in the respective index.

In the case of PPI, statistics are provided at base year (2010=100), however UVI statistics are reported on previous year prices. Therefore, we have to adjust the series to base year 2010 in order to reflect the same pattern as PPI data. The period of analysis runs between 2005 and 2014 applying quarterly data.

In the next stage, the two series are checked for their stationarity patterns through unit root test (according to the Augmented Dickey-Fuller and Phillips-Perron test procedures). Following the confirmation of non-stationarity for both data sets, we apply the Johansen procedure to test the presence of co-integration applying the Schwarz Criterion for lag determination. Having determined the presence of co-integration we proceed with the estimation of a linear VEC model with the two variables. In the short-term relationship we introduce dummy variables to capture the effects of positive or negative changes of the UVI index on the PPI index. Additionally, we turn on the long-term relationship to check for the presence of non-linearities.

4. ESTIMATIONS

4.1 UNIT ROOT TEST, CO-INTEGRATION AND VEC FRAMEWORK

As we mentioned in the previous section of data and methodology, we proceed with the determination of stationarity (non-stationarity) patterns on the two variables expressed in logarithms. The phenomenon is determined via unit-root test according to the Augmented Dickey-Fuller and Philips-Perron tests. The results are shown in the following table:

Table 2. Unit Root Test results (probabilities)

Augmented Dickey Fuller test						
	Level			First difference		
	Intercept	Trend/inter	None	Intercept	Trend/inter	None
PPI	0.33	0.97	0.99	0.00	0.00	0.00
UVI	0.48	0.88	0.98	0.00	0.00	0.00
Phillips-Perron test						
	Level			First difference		
	Intercept	Trend/inter	None	Intercept	Trend/inter	None
PPI	0.33	0.97	0.99	0.00	0.00	0.00
UVI	0.42	0.93	0.99	0.00	0.00	0.00

Source: author's calculations

The evidence from the unit root tests demonstrates that both variables are non-stationary at level (stationary at first difference). Since both variables are stationary in the same order I(1), we are able to perform the Johansen test of co-integration. The Schwarz Information Criterion is applied for the determination of the number of lags. Results suggest the adoption of the co-integration test using two lags. Results from the co-integration test are shown in the following table:

Table 3. Result of co-integration test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Statistic	0.05	
No. of CE(s)	Eigenvalue	Trace	Critical Value	Prob.**
None*	0.52	36.41	20.26	0.00
At most 1	0.15	6.88	9.16	0.13

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Unrestricted Ciintegration Rank Test (Max-Eigen value)				
Hypothesized		Statistika	0.05	
No. of CE(s)	Eigenvalue	Max-Eigen	Critical Value	Prob.**
None *	0.52	29.52	15.89	0.00
At most 1	0.15	6.88	9.16	0.13

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

According to the table above, both trace test and max eigenvalue tests indicate the presence of 1 co-integrating relationship between the two variables. Therefore, we proceed with the estimation of the linear VEC model and the results are shown in the following table:

Table 4. VECM results

Variable	Coefficents
Long-term	
UVI	0.42***
Adjustment coeff.	0.31**
Short-term dynamics	
PPI(-1)	0.19
PPI(-2)	-0.12
UVI(-1)	-0.08
UVI(-2)	0.058

*Source: Author's calculations; *** denotes statistical significance at 1% intervals; ** denotes statistical significance at 5% intervals*

From the results we can observe the presence of a comparatively large and positive long-term coefficient (0.42). The adjustment term is also statistically significant displaying a figure of 0.31. It is important to emphasize that these coefficients are larger compared to the estimation (MEAM re-evaluation) that directly connect import prices to the consumer price index. Therefore, our estimations confirm the initial hypothesis that a larger portion of pass-through from import prices goes into producer prices. That is also in line with BEC trade figures which reveal a larger presence of intermediate consumption goods compared to consumer and capital goods combined.

4.2 ASYMMETRIES AND NON-LINEARITIES

In accordance with the technique applied by Rumankova (2014), we modify the VEC model to allow for the presence of asymmetry in the short-term relationship. This is achieved by introducing dummy variables to denote positive or negative changes in the UVI index. Such dummies are separately introduced to capture contemporaneous effect (dummies introduced at moment t) and also distributed lag effects (dummies introduced at lags) up to 3 lags. The results are shown in the following tables. The cases reflecting different coefficients are market in red:

Table 5. Coefficients for positive and negative changes in UVI

	Positive	Negative
t	0.0022	0.0038
t-1	0.0043**	0.0004
t-2	0.003	0.005**
t-3	0.0034	0.004

*Author calculation: ** denotes statistical significance at 5% intervals*

According to the table, in terms of contemporaneous asymmetry, the coefficients differ. However they are statistically insignificant. That is also the case for the third lag. In regard to the first and second lag, the coefficients are different and there is also the presence of statistical significance. Dummies for positive changes are larger and statistically significant in the first lag, whilst the same holds true for negative changes in the second lag. Beyond the third lag, lag coefficients for positive and negative changes in UVI are both similar and statistically insignificant.

Based on these results, we can confirm with statistical significance the presence of distributed lag asymmetry. There are signs of contemporaneous effects but as mentioned the coefficients are statistically insignificant. Furthermore, the cumulated impact of lags does not reveal the presence of asymmetry.

In order to check for non-linarites in the long-term relationship we perform a non-linearity test on the VECM residual (BDS test). The test parameters reflect embedding dimensions equal to 2 and a metric bound equal to the standard deviations of the residual (Kumar, 2006). The results from the test are shown in the table below.

Table 6: BDS test on VECM residual

BDS Statistic	Std. Error	z-Statistic	Prob.
0.01	0.014	0.75	0.45

Source: Author's calculations

According to the table above, BDS statistic test does not reject the linear pattern of the long-term relationship confirming the linear VECM as an appropriate specification.

5. CONCLUSIONS

According to the results of the investigation, we are able to find a strong co-integrating pattern in the relationship between import prices and producer prices. Unlike the direct case with consumer prices (investigated in other contributions), the long-term and adjustment coefficients are larger and of course statistically significant. That is in line with the assumption of the existence of this potential channel given the structure of commodity imports (larger contribution from intermediate goods) and also with findings from Celiku (2003).

Additionally, we find traces of asymmetric effects in the short-term relation. To be more specific, distributed lag asymmetries are shown with statistical significance, while we also spot signs of contemporaneous asymmetries. Nevertheless, the latter are statistically insignificant. In regard to the long-term relationship, tests for linearity of the residual confirmed the linear VECM framework as the appropriate specification tool.

6. DISCUSSION, FUTURE RESEARCH PROSPECTS AND POLICY IMPLICATIONS

The paper attempts to identify a possible transmission of import prices toward producer prices. The motivation is based upon the absence of literature related to this particular channel and also the fact that certain investigations concerned with the transmission from imports directly to consumer prices seems to show weak transmission effects. The analysis is furthermore stimulated by the general structure of Albanian commodity imports with majority share of intermediate consumption goods over consumer and investment goods combined between them.

The methodology adopts a VECM framework given the presence of non-stationarity and tested co-integration between the UVI and PPI representing import and producer prices respectively. The short-term composition was modified to allow the presence of dummy variables with the purpose of capturing possible asymmetric effects. Furthermore, the long-term co-integration relationship was tested for the presence of non-linarites.

The results have confirmed a strong relationship between the two variables justifying the existence of this particular channel of transmission. Additionally, we have found evidence of short-term asymmetries in the form of distributed lag effects. We also find weak sign of asymmetric contemporaneous effects. In regard to the long-term relationship, BDS tests of the residual do not reject the correctness of applying the linear VECM technique.

These findings shed some light into the presence of this additional channel to complement the traditional direct impact of import prices to consumer prices. Indeed, there are also examples from the literature which have demonstrated that high reliability of one economy to imported inputs makes production costs

(and ultimately market prices) very dependent on international developments of input prices. That could also be the case of Albania. Nevertheless, this paper does not include the last link of the chain: impact of producer prices on consumer prices. That remains to be investigated in the future.

At the moment certain limitations of this research contribution must be pointed out. For starters, the period covered includes barely 10 years of quarterly data (due to data availability). The availability of series before 2005 (in particular regarding producer prices) would expand the sample and check for the presence of possible regime shifting effects. Truly, the modern techniques of price transmission econometric include the presence of thresholds and regime switching effects. However they require longer data sets (sometimes in monthly data). Availability of such data would certainly identify non-linarites in the long-term relation and enable the employment of these more advanced techniques to demonstrate how the effects might have changed through-time (or through regimes maintaining the presence of co-integration).

Another important challenge relates to the quality and quantity of price data. The PPI is composed of the individual price indices of the respective industries. On the other hand, UVI is composed of the different categories of imported goods and the weighting is carried out on the basis of individual contribution to overall imports. Given that the specifics of individual index calculation and weighting differ between the two variables, there is not a direct connection between the two. Indeed, there are not many examples of price transmission that deal with composite indices. The majority of literature focuses on individual prices like gasoline, alimentary and agricultural products. In brief, future research has to focus more on the micro-analysis of price transmission which is definitely more reliable and unbiased.

Furthermore, in the case of Albania, unlike the UVI which is composed of the individual indices of all import commodity categories, the PPI index consists of the individual indices of industry (mining and manufacturing), electricity generation and water supply. Combined these sectors account for nearly 27% of overall intermediate consumption and 30% of goods' intermediate consumption (INSTAT). The general service sector (with the exception of trade) and agriculture obtain very marginal share of inputs and their omission from the analysis does not present grave implications. However, construction attracts the bulk of intermediate consumption and it is important to be included in future analysis. Unlike the sectors included in the PPI which have an ample distribution of their intermediate consumption pattern, construction exhibits major concentrations of the categories of goods it purchases (mainly non-metal products and fuel). In this sense, more specific import indices would have to be calculated and used in the modeling. In this regard, also the connection of producer prices to consumer prices will require some modification in one of the indices.

In line with more micro-analysis in the matter, econometric empirical investigation has to be coupled with more emphasis on accounting analysis from Social Accounting Matrixes (SAM) (supply, use and input-output tables).

These statistics are still in the early stages of development and only reflect nominal data. In the future, the availability of real term and non-competitive SAM data would enable the incorporation of a more appropriate and reliable framework in identifying the contribution of import prices on producer and also final demand prices. That would also enable a better knowledge of the general cost structure and its components (if income side data is also incorporated). Rigidities and asymmetries would also be easier to identify and interpret.

In regards to policy implications, the existence of this channel of import price transmission does reflect the need to closely monitor producer prices and further include them in the analysis of costs and their implication of general inflation. Of course that does not imply a policy shift towards producer prices. However, since costs represent a short-term influence channel of inflation, it is important that they are correctly modeled and their influence correctly calculated. Miscalculations might transfer cost influence on other variables (e.g. output gap or expectations) and suggest an incorrect policy response. Additionally, the backdoor channel of import price transmission is important in defining the appropriate amount of foreign influence and its actual impact on prices.

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FOREIGN RESERVE HOLDINGS: AN EXTENDED STUDY THROUGH RISK-INSPIRIED MOTIVES

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ABSTRACT

This paper examines the demand for foreign reserve holdings for the Albanian small open economy. The model is estimated through the Vector Error Correction Model approach. Results provide supportive evidence that reserve accumulation is more sensitive to precautionary motives rather than mercantilist ones. Other results reconfirm that current account patterns and fiscal imbalances are the main driving forces behind reserve holding. By contrast, reserve was yet again found less sensitive regarding the opportunity cost and mercantilist motives.

Keywords: Foreign reserve holdings, trade openness; short-term capital movements, VECM.

JEL Classification: C52, F32,

I. INTRODUCTION

The accumulation of foreign reserve holdings has been an integral part of the Albanian monetary policy to balance of payment approach, outlined as a bottom rule-of-thumb level sufficient to cover four months of imports. Over the past two decade, the level held by monetary authorities in Albania has satisfied this ratio throughout each period, even exceeding it. However, in the recent years, this level is even higher than the other performing rule-of-thumb related to the intermediate money and national output. During this time, holdings rose from only 13% in early 2000s' to nearly 20% - 21% along the period 2010 – 2013. In addition, in the last decade, the Bank of Albania has accumulated stock that covered on average nearly 145% of total short-term debt (private plus public (external)). This ratio was around 110% in the year 2012. However, the actual stock exceeds more than four times the Guidotti-Greenspan rule-of-thumb[2] relating to the precautionary motives to short-term external debt coverage.

Furthermore, over the years, but mostly in the future the stock of reserve faces a fivefold challenge[3]. First, under an inflation targeting regime and flexible

* *The views expressed herein are of the authors and do not necessarily reflect the views of the Bank of Albania.*

2 *See Greenspan, A., (1999)*

3 *Shijaku, (2012).*

exchange rate regime, the monetary policy strategy is continuously reflecting more the Friedman's approach, even though money continue to play a crucial role in the long run. Second, the operational policy has recently moved from targeting money circulation to targeting short-term interest rates. Third, Albania has not received high foreign direct investments like other transition countries, but it is potentially attractive and a great opportunity for capital market investment. Fourth, in the case of Albania, raising the level might exceed the precautionary motives and place more forgone earnings, since it has an opportunity cost. Further, many research papers[4] emphasise the fact that demand reserve is also sensitive to capital account patterns, especially to sudden stop episodes. In a recent work, Shijaku (2013) supports the view that Albania has experienced episodes of sudden stops, but they have been more frequent after the financial and global crises. As such, the extensive accumulation of foreign reserves naturally prompted questions whether current levels can be justified on economic grounds and risk-inspired indicators.

In general, reserve accumulation patterns present both a theoretical and an empirical challenge, but as yet there is little consensus and only modest success on either front. Most research on the international reserve coverage has so far concentrated on the precautionary motives. In the Albanian context, research on reserve has received attention only recently. An earlier work by Shijaku (2012a), using the buffer stock model of Frenkel and Jovanovic (1981), has interpreted the precautionary motive of reserve accumulation central to that specification in terms of the theoretical balance of payment needs literature. Therefore, this paper first, extends the time span of the empirical work by Shijaku (2012a). Second, it includes a broader set of macroeconomic conditions, namely current and capital account patterns, economic size, sovereign risk, opportunity cost and money disequilibrium. Third, we assess demand for reserve holdings though means of Vector Error Correction Mechanism (VECM) techniques using quarterly data.

Results provide supportive evidence that reserve accumulation is more sensitive to precautionary motives rather than mercantilist ones. Other results reconfirm that current account patterns and fiscal imbalances are the main driving forces behind reserve holding. By contrast, reserve was yet again found less sensitive regarding the opportunity cost and mercantilist motives.

The rest of the paper is organised as follows. Section 2 presents the methodology and the data. Section 3 summarizes the results. The paper concludes in section 4.

[4] *Calvo et. al. (2004, 2008), Cavallo and Frankel (2008), Jeanne and Rancière (2006).*

2. THE METHODOLOGY AND THE DATA

A. MODEL SPECIFICATION

The majority of studies[5] argue that matters of reserve demand more directly correspond to the balance of payments needs. In this sense, the reserve holdings are seen as a principal component to guarantee and to pursue domestic policy goals in the face of temporary external sector shocks. By contrast, other studies[6] justify that reserve demand is linked to a broader concept than the balance of payment's determined definition of reserve assets. Thus, they suggest assessing the adequacy demand by shedding light on the relative importance of other different variables. IMF, (2003) identifies five categories of variables, namely: economic size; exchange rate flexibility; opportunity cost; and current and capital account vulnerability. Through this paper we try to estimate the demand for reserve taking to account the motivation of holding them. We follow the methodology by Sehgal and Sharma (2008)[7] and investigate the demand for reserve in the case of Albania by means of VECM techniques, for the period 1998:01 – 2012:04, as follows:

$$\Delta X_{it} = \beta_0 + \alpha_i \left(X_{it-1} + \sum_{i-1}^{p-1} \beta_i X_{it-1} \right) + \sum_{i=1}^{p=1} \beta_j \Delta X_{it-1} + \beta_j Z_{it} + \varepsilon_{it} \qquad (1)$$

Where, Δ is the difference operator, β_0 is a vector of constant terms, β_i and β_j are the matrices of the coefficients measuring the long-run and short-run lagged effect of variables on each other, α_i is the parameter for the speed of adjustment towards equilibrium, $\varepsilon_t = [\varepsilon_{st}, \varepsilon_{bt}]$ is the vector of error terms and $\varepsilon_t \sim iid(0,\sigma^2)$; X_{it} is a vector of κ observable endogenous variables used to explain reserve demand such as trade openness, economic activity, level of debt burden and opportunity cost of holding reserve by the monetary authority; Z_{it} is a set of exogenous variables such as the volatility in Foreign Direct Investment (FDI) and money market disequilibrium.

The proxy on trade openness does not seem unreasonable for a country whose balance of payments is mainly dominated by the current account. Traditionally, this variable has been based on the prospective of imports. But, in our model, this proxy is extended to include also the level of exports. From a current account perspective, exports are important because they generate foreign exchange income which, in turn, is used to finance imports [Steiner, (2009)]. Thus, including exports allow to fully account for the current account

[5] *Frenkel and Jovanovic (1981), Aizenman and Marion, (2002), Calvo (1998), Prabheesh, et. al., (2007), Bernard (2011).*

[6] *Edwards (1985), Ramachandran (2004), Jeanne and Rancière, (2006), Ramachandran (2006), Gonçalves (2007), Jeanne and Rancière (2006), Obstfeld, Shambaugh and Taylor (2008), Prabheesh (2009), Moghadam, Ostry and Sheehy (2011).*

[7] *The paper considers a set of scale variables for transactions motive, precautionary motive, mercantile motive, and the sensitive components of capital account, namely quarterly GDP, average propensity to import, exports, short-term external debt, capital inflows and the opportunity cost of holding reserves.*

developments[8]. Following Frenkel and Jovanovic (1981), it is expected that reserve holdings will increase with respect to trade openness and the raising level of foreign transaction payments in monetary value. Similarly, it is expected that reserve will rise with respect to economic size. In return, reserves generally are exposed to opportunity costs, expressed through forgone earnings. A higher opportunity cost is expected to lead to a reduction in reserve, because alternative investments become comparatively less attractive[9].

Many studies take into account the sovereign risk of a country to estimate the adequacy level of reserve holdings. Closely linked to the Guidotti-Greenspan rule, it is argued that short-term foreign debt (STED) is an important well-establish source of vulnerabilities link to crisis and sovereign risk, and as such has a key role in any assessment of reserve adequacy[10]. But, due to the data limited issues[11], we considered the three other indicators, respectively: the stock level of total debt, domestic and foreign debt. Therefore, all the three components are used separately in the model. Larger size of these variables indicates for higher probability of liquidity at risk; therefore, in a case of precautionary motive of reserves holding, the sign of the coefficient should be positive [Sehgal and Sharma, (2008)].

Following other empirical studies[12], we also test the monetary approach in the model[13]. But, three specification issues come up. First, based on Calvo (1996), the Albanian vulnerability to crisis is measured by the size of its money supply, as it is a natural upper limit on the extent of possible asset withdrawal. Second, according to Badinger, (2004) the effect of money disequilibrium is likely to affect only in the short run. Third, referring to the monetary policy strategy of the Bank of Albania, reserve holdings is managed under the Monetary Approach to Balance of Payment strategy carried out in light of the IMF arrangements. Money has and will continue to play an important indicative role on monetary policy in the long run, but inflation forecasting and expectation have already the leading role in setting policy in the short and medium run[14]. Therefore, based on Sehgal and Sharma, (2008) we have included the money disequilibrium indicator, M3, as an exogenous variable. Another exogenous variable in short analysis is volatility of foreign capital inflows. Accordingly[15], capital inflows are volatile in nature and flows could revert back any point of time that would need a sufficient reserves backup, otherwise the economy may face serious financial crisis. We accommodate this variable in the demand function through including the EGARCH estimation

[8] *Obstfeld, et. al. (2008) used this variable because of its robustness as an explanatory variable in other empirical studies.*

[9] *Frenkel and Jovanovic (1981) and Ben-Bassa and Gottlieb, (1992).*

[10] *See: Furman and Stiglitz, (1998), Radelet and Sachs (1998), Sehgal and Sharma (2008).*

[11] *A problem with STED is that the time period for which data are available are annually and starts from 2006.*

[12] *See: Edwards, (1984), Elbadawi (1990) and Badinger (2004).*

[13] *Theoretically, excess supply of money may affect the reserves flows. According to Edwards, (1984) this approach suggests a country's balance of payments disequilibrium is directly related to disequilibrium in country's domestic money market. In a case of an excess demand for money, it must be satisfied by an increase in foreign exchange holdings of a country's central bank.*

[14] *See Bank of Albania Monetary Policy Document and Shijaku (2012).*

[15] *Sehgal and Sharma, (2008).*

for the volatility of capital inflows, FDI. We expect a positive sign for both coefficients of these variables.

B. THE DATA

In our specified reserve regression model, the dependant variable, IR, represents the total stock level of reserve holdings, excluding the stock value of gold. Data on trade openness index, TB, represent the sum of total import plus exports of goods and services to nominal GDP ratio. GDP represents information on the nominal Gross Domestic Product. Debt represents the stock level of public debt to nominal GDP ratio. The estimated variable of opportunity cost, OC, expresses the difference between the 3, 6 and 12-month weighted average bill rates and 10-year Eurobonds monthly rate of return to the yield of investing reserves measured by 1-3 year German emissions index. Regarding other data, M3 represent the estimated residual of the long-run equilibrium money demand evaluated by Shijaku (2012) and FDI is an EGARCH volatility estimated index for the Foreign Direct Investment. Data, besides OC, enter the model specification in logarithm form. The data on quarterly GDP are taken from the Albanian Institute of Statistics (INSTAT) and those on Debt are taken from the Ministry of Finance. Data on Eurobonds are taken from the official website of the European Central Bank (ECB). The rest is taken from the Bank of Albania.

3. RESULTS

This section presents the main empirical results on the variables used to determine the main indicators of foreign reserve holdings in the case of Albania. First, the results of the Unit root (ADF and PP) test (reported in Table 2 in Appendix) provide supportive evidence in favour of our choice to use the VECM approach as an estimation technique. Second, the VECM estimation approach considers a 3 lags length specification model based on the results of stability and LM-test for serial correlation for a 4 lags length VAR model. The JCT results (Table 3 in Appendix), based on an unrestricted constant and a linear trend in the variables, but not in the co-integration relationship, reveals that there is one co-integrating vector present in specified model.

The empirical results of the main determinants of the demand for foreign reserve holdings (IR) are given in Table 7[16]. First, model [1] reports the results of the model specification as specified in Equation (1)[17]. The normalised co-integrating equation shows the standard statistical values in parenthesis indicate that the explanatory variables are significant at 1 per cent level, except the OC. Therefore, we re-estimate Equation 1, but we use OC as an exogenous variable by excluding it from the long-run relationship. The results are reported

[16] *Further, based on the joint weak-exogeneity LR-test tests on the non-significant α-coefficients, we report the elasticities of a more parsimonious model.*

[17] *Meanwhile, based on Sørensen, Ibáñez and Rossi (2009), Johansen (1991, 1992, 1995) and Juselius (2003), the LR-test of restrictions and the p-value, rejected the null hypothesis on the stationary I(0) properties of OC*

in Table 7 (Model [2]). The diagnostics tests (Table 4 – 6 in Appendix) in both cases reveal no evidence of serial correlation, heteroskedasticity and non-normality of the VAR residuals, while the stability test was successfully passed.

With regards to the results of our main model specification they indicate that all the coefficients of the explanatory variables have the expected theoretical signs. First, as in the case of Shijaku (2012a), TB continues to exhibit the highest impact on the demand for reserve in the long run equilibrium. The size of the coefficient indicates that 1pp increase in trade openness results in less than 0.39pp raise in reserve holdings. This is consistent with an increasing role of self-insurance and precautionary holding of reserves motives against the persistent current account deficit in Albania during the sample period. This is consistent with other empirical estimates for transition and developing economies[18] where current account dynamics are the main affecting force on the movements and accumulation of reserve holdings. Similarly, fiscal instruments are found to be positively correlated with reserves demand. But, besides total debt (DEBT), others[19] are found to be statistically insignificant. This impact is estimated to be nearly 0.32pp for every 1pp raise in debt to GDP ratio, which imply that the Bank of Albania might have taken 'Liquidity at Risk' very seriously and adjusts reserves holding according to the total size of risk. Such results also enforce the argument of the self-insurance and precautionary motive of reserve holdings. Likewise, as an income indicator, the measure of GDP has positive relationship with reserves holdings. This result very much follow the theoretical assumptions, as income of the economy increases, more reserves holdings is required. Reserve would respond by nearly 0.16pp to an increase economic size by 1pp. The opportunity cost (OC) enters the un-restricted co-integrating vector none significantly. The impact was found relative low compared to other variables.

Furthermore, results on exogenous variables are mixed. The measure of volatility in capital inflows (FDI) is found to have a negative small and non-statistically significant coefficient. A preliminary assumption might be that Bank of Albania puts more attention to current account patterns than to developments in financial account. Similarly, as in Shijaku (2012a) it might confirm the non-mercantilist reserve management strategy by the Bank of Albania. Money disequilibrium indicator (M3) has the excepted positive sign and is statistically significant[20]. Excess demand for (supply of) money leads to an increase in reserves with an elasticity of 0.35. From a monetary point of view, based on Sehgal and Sharma (2008), this result infers upon two main responses. First, the monetary authority does not take measures to correct the money market disequilibrium by changing rate of the interest rate and domestic credit. Second, the monetary authority leaves correction completely on the market forces to restore the equilibrium.

[18] *See Prabheesh (2007), Sehgal and Sharma (2008) and Frenkel and Jovanovic (1981).*

[19] *Namely the stock of domestic, external and short term external debt.*

[20] *We also evaluated money market indicators [money supply (M3) or intermediate money (M2)] as endogenous variables. But, both coefficients are found to be statistically insignificant, even with a positive sign.*

Others results demonstrate the coefficient of time trend is statistically significant and has the expected positive sign. This evidence, as in Shijaku (2012a), reconfirms that in time, further improvement of managerial and investment skills will eventually lead to higher reserve holdings. The dummy measure to account for the financial and economic post-crisis effect has a relative small positive sign and is significant at 5 per cent. But, this impact should be viewed cautiously. We also find a relatively higher, but still small positive impact, significant at 10 per cent, when an alternative dummy variable to account for the effect of liberalising capital account fully was used instead. However, both of these results emphasises more the precautionary motive of reserve holdings. Moreover, the readjustment coefficient (ECM) has a negative sign and is significant at 1 per cent. However, the magnitude is higher than the reported coefficient by Shijaku, (2012a). On the one hand, this might be the case due to greater availability of data on real time, given the empirical estimation is based on quarterly data. On the other hand, it might be a hint towards a relatively more active reserve management strategy, in the verge of raising uncertainties due to financial and economic crisis. Meanwhile, based on Prabheesh, et. al. (2007), this provides evidence that the return to equilibrium will require the use of relatively less amount of reserves to finance the balance of payments needs.

IV. CONCLUDING REMARKS

The monetary authority in Albania has accumulated foreign reserve based on the Monetary Policy to Balance of Payment approach. Over the years, the stock level has been relatively higher than the four months of import coverage rule-of-thumb criteria. Recently, it has exceeded other benchmark levels relating to the national output, intermediate money and the Guidotti-Greenspan rule-of-thumb. For these reason, this paper investigates empirically the main determinants of the demand for foreign reserve holdings in the case of Albania. The model is estimated using the VECM techniques. It consists of a sample for the period 1998 - 2012.

Results confirm previous findings that support the theoretical assumption of the demand for foreign reserve holding suggesting that there is a long-run co-integration relationship between the level of foreign reserve and considered explanatory variables. Other results provide also supportive evidence that current account developments still exhibit a high influence and is the main force affecting the movements and accumulation of reserve holdings. Taking to account the effect of fiscal indicators, findings confirm the precautionary motives for reserve accumulation in the verge of persistent current account deficit and raising debt burden. Reserve was yet again found less sensitive regarding the opportunity cost and mercantilist motives, but a higher adjustment coefficient implies a relatively more active reserve management strategy, in the verge of raising uncertainties due to financial and economic crisis.

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APPENDIX I

Table 1. Variable definition and description.

Variable	Description	Source
IR	Logarithm of the total stock level of reserve holdings excluding the stock value of gold.	BoA
TB	Logarithm of the sum of total import plus exports of goods and services to nominal GDP ratio.	BoA
GDP	Logarithm of the nominal Gross Domestic Product.	INSTAT
Debt	Logarithm of the stock level of public debt to nominal GDP ratio.	MoF
OC	Logarithm of the difference between the 3, 6 and 12-month weighted average bill rates and 10-year Eurobonds monthly rate of return to the yield of investing reserves measured by 1-3 year German emissions index.	BoA, MoF, ECB
FDI	An EGARCH volatility estimated index for the Foreign Direct Investment.	Authors callculationas
M3	The estimated residual of the long run equilibrium money demand.	Shijaku (2012b)

Table 2. Unit Root Testa, period 1998 Q01 – 2012 Q04.

Variable	Level			First difference		
	Intercept	Intercept and trend	None	Intercept	Intercept and trend	None
Augmented Dickey Fuller (ADF) test						
IR	[0.0052]	[0.7773]	[0.9996]	[0.0000]	[0.0000]	[0.0000]
TB	[0.7341]	[0.8149]	[0.9945]	[0.0000]	[0.0001]	[0.0000]
GDP	[0.0002]	[0.4582]	[0.9994]	[0.0000]	[0.0000]	[0.0367]
Debt	[0.2147]	[0.4612]	[0.2387]	[0.0000]	[0.0000]	[0.0000]
OC	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
M3	[0.0717]	[0.0234]	[0.0063]	[0.0006]	[0.0041]	[0.0000]
FDI	[0.0000]	[0.0000]	[0.0002]	[0.0000]	[0.0000]	[0.0000]
Phillips-Peron (PP) test						
IR	[0.0039]	[0.7780]	[1.0000]	[0.0000]	[0.0000]	[0.0000]
TB	[0.0844]	[0.0000]	[0.8632]	[0.0000]	[0.0000]	[0.0000]
GDP	[0.0007]	[0.4923]	[1.0000]	[0.0000]	[0.0000]	[0.0002]
Debt	[0.0018]	[0.0076]	[0.0739]	[0.0000]	[0.0000]	[0.0000]
OC	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
M3	[0.1003]	[0.0293]	[0.0098]	[0.0000]	[0.0000]	[0.0000]
FDI	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]

a automatic lag selection based on Schwarz Info Criterion (SIC)

Source: Author's calculations

Table 3. Johansen Cointegration Test.

Sample (adjusted): 1999 Q1 – 2012 Q4				
Included observations: 56 after adjustments				
Trend assumption: Linear deterministic trend				
Series: IR TB GDP Debt OC				
Exogenous series: M3 Δ(FDI) @TREND				
Warning: Critical values assume no exogenous series				
Lags interval (in first differences): 1 to 3				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.501435	85.67830	69.81889	0.0016
At most 1	0.357256	46.70107	47.85613	0.0639
At most 2	0.251766	21.94856	29.79707	0.3013
At most 3	0.091962	5.706358	15.49471	0.7299
At most 4	0.005416	0.304112	3.841466	0.5813
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.501435	38.97723	33.87687	0.0113
At most 1	0.357256	24.75251	27.58434	0.1105
At most 2	0.251766	16.24220	21.13162	0.2110
At most 3	0.091962	5.402246	14.26460	0.6904
At most 4	0.005416	0.304112	3.841466	0.5813
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values				

Source: Author's calculations

Table 4. VEC Residual Serial Correlation LM Tests.

Null Hypothesis: no serial correlation at lag order h		
Sample: 1998 Q1 – 2012 Q4		
Included observations: 56		
Lags	LM-Stat	Probability
1	41.03835	0.2270
2	24.22980	0.5061
3	27.27140	0.3425
4	28.01961	0.3070
Probabilities from chi-square with 25 degree of freedom.		

Source: Author's calculations

Table 5. VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Sample: 1998 Q1 – 2012 Q4		
Included observations: 56		
Joint test:		
Chi-sq	df	Prob.
594.6	570	0.2303

Source: Author's calculations

Table 6. VEC Residual Normality Tests.

Orthogonalization: Cholesky (Lutkepohl)				
Null Hypothesis: residuals are multivariate normal				
Sample: 1998 Q1 – 2012 Q4				
Included observations: 56				
Component	Skewness	Chi2	Degree of freedom	Probability
1	0.800638	5.982867	1	0.0144
2	0.344352	1.106731	1	0.2928
3	-0.174025	0.282658	1	0.5950
4	0.073072	0.049836	1	0.8233
5	0.268609	0.673407	1	0.4119
Joint		8.095499	5	0.1511
Component	Kurtosis	Chi2	Degree of freedom	Probability
1	3.584665	0.797610	1	0.3718
2	3.783925	1.433923	1	0.2311
3	3.637518	0.948336	1	0.3301
4	2.575675	0.420121	1	0.5169
5	3.351019	0.287500	1	0.5918
Joint		3.887490	5	0.5657
Component	Jarque-Bera		Degree of freedom	Probability
1	6.780477		2	0.0337
2	2.540654		2	0.2807
3	1.230993		2	0.5404
4	0.469957		2	0.7906
5	0.960907		2	0.6185
Joint	11.98299		10	0.2862

Source: Author's calculations

Table 7. Long-run estimation of IR demand through VECM approach

Sample (adjusted): 1999 Q1 – 2012 Q4, Included observations: 56 after adjustments.		
	Model [1]	Model [2]
C	3.001	2.86
TB	.4055	0.38
	[*3.38*]	[*3.45*]
GDP	.1456	0.153
	[*2.6*]	[*8.43*]
DEBT	.2764	0.450
	[*1.2*]	[*4.65*]
OC	-0.0032	
	[*-0.2*]	
ECM	-0.629	-0.659
	[*-3.18*]	[*-3.56*]
	Exogenous Variable	
M3	0.338	0.398
	[*2.59*]	[*2.98*]
FDI	-0.008	-0.007
	[*-0.83*]	[*-0.70*]
@TREND	0.005	0.005
	[2.95]	[3.03]
R2	0.65	0.65
R2-Adj	0.47	0.47
t-statistics in [ ] aCo-integration Restrictions: B(1,1)=1, B(1,5)=0, A(2,1)=0, Chi2=0.064471; Prob.= 0.97		

Source: Author's calculations

BANK COMPETION IN ALBANIA: AN ANALYSIS THROUGH THE BOONE INDICATOR

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1. INTRODUCTION

The issue of competition in the banking sector has attracted much interest in recent years, not only because of the recent financial crisis, but also due to globalisation, worldwide liberalisation of financial markets and banking harmonisation. Alongside the usual concerns about competition, the issue has additional significance in banking because of its crucial role on non-financial activity. Many theoretical papers have attempted to explain the ambiguous consequences of competition on access to credit, cost and quality of financial services, innovation, the stability of financial systems, and thus economic development. However, to empirically address these important questions, one needs to come up first with reliable measures of the intensity of bank competition as the more accurate the measure, the more precise empirical results are likely to be [Leon (2014)]. The fact that competition is a complex notion and therefore not directly observable, has resulted in the development of many methods for its assessment.

In the literature of the banking sector, the measurement of competition has been categorised into two main approaches: structural and non-structural. The structural approach measures competition based on market structure indicators on the assumption that the likelihood of tacit collusion and their ability to exercise excessive market power increases with market concentration [Arrawatia (2012)]. The most straightforward method is to calculate what share of the sector's output is hold by a few firms (usually in terms of assets), which frequently includes measures of the numbers of banks, market share and concentration ratio and/or the Herfindhal-Hirschmann Index (HHI). The non-structural approach on the other hand examines competitive conditions based on bank level behaviour. This approach usually includes measures of price-cost margins (PCM) such as the Panzar-Rosse H-statistic and the Lerner index[1]. Both of these approaches have been previously estimated in the case of Albania. For example Note (2006) applies the Panzar-Rosse methodology to measure the competition degree in the Albanian banking system during the period 1999 - 2006. The author finds that Albanian banks operate in monopolistic competition conditions. Dushku (2015) calculates the Lerner index in the case of Albania. Results show that in 2004-2014, the competition of banks in Albania stands between the complete competition and the monopolistic one. More recently, Shijaku (2016) also calculates HHI, which reveals that banking sector in Albania is moderately concentrated.

In fact, it seems fair to say that concentration measures, like Herfindahl and

[1] *The Lerner index has been widely used in recent research including Berger, et. al., (2009), Cipollini and Fiordelisi (2012); Fu, et al (2014).*

the PCM are among the most popular one, but both operational sets of these indicators are potentially a poor measure of competition and misleading [Bulow and Klemperer (2002) and Boone, et al., (2007)]. The SCP approach consists of indicators that are rather crude measure, which does not take into account the distribution of firms as a high market concentration may be consistent with fully contestable markets [Claessens and Laeven (2004)][2]. They do not even take into account that banks with different ownership behave differently and banks might not compete directly with each other in the same line of business, as well as they do not measure the competitive conduct of banks at the margins [Carbó, et. al.(2009)]. On the other hand, measures of the weighted average PCM can increase if the surge in the market share of the most efficient firms over-compensates a generalized decrease at an individual level. In addition, as explained by Schiersch and Ehmcke (2010), both approaches can point to a wrong direction due to the reallocation effect as competition intensifies (more aggressive conduct), market shares of efficient banks increase at the expense of inefficient banks. Incorrectly, this implies that HHI goes up indicating a fall in competition. At the same time, this shifts market shares from banks with low PCM to banks with higher ones. This can lead to an increase in sector average PCM, indicating incorrectly a fall in competition[3]. Moreover, the H-statistic requires restrictive assumptions about the market being in a long-run equilibrium and does not differentiate between competition in loan and deposit markets [Schaeck and Cihak (2010)][4]. To that, Bikker, et al., (2012) show that H-Statistics cannot be used to infer the degree of competition as the approach request additional information about costs, the state of market equilibrium and possibly market demand elasticity to allow meaningful interpretations. Similarly, the Lerner index captures both the impact of pricing power on the asset side and funding side of the bank, but is also subject to two major concerns. First, as summarised by Linderberg and Ross (1981), it does not recognize that some of the deviation of price level from marginal cost comes from either efficient use of scale or the need to cover fixed costs. That is that price may deviate from marginal costs for reasons other than monopoly. Or price may be close to marginal costs, despite considerable monopoly power. Second, it is also important to say that the Lerner index does not provide any information on the efficiency structure hypothesis as assumed by Demsetz (1973) that fiercer competition enables more efficient banks to achieve superior performance in terms of higher profits at the expense of their less efficient rivals and also attract greater market share.

By contrast, most recent studies[5] in the banking industry employ the relative profit differences (RPD) approach proposed first by Boone (2004) and further developed by Boone (2008) to assert the evolution of bank competitive over

[2] *Boot and Ratnovski (2016) implies that this is especially true in modern banking.*

[3] *Bikker, et al (2012) implies that this type of index might reveal a greater extend of competitiveness than the market structure would suggest, while others find much more market power than the market structure would suggest.*

[4] *According to Switala, et. al., (2013) this measure imposes certain restrictive assumptions on bank's cost functions, while the inference from this measure derived from the profit-maximizing condition is only valid if the market in question is in equilibrium.*

[5] *See among others Van Leuvensteijn, et al., 2011, Van Leuvensteijn, et al., 2013, Fiordelisi and Mare 2014, Kasman and Carvallo 2014, Schaeck and Cihák 2014, Duyguna, et al., 2015, Kasman and Kasman 2015.*

time. The Boone competition indicator has a similar theoretical explanation as the efficient-structure hypothesis suggested by Demsetz (1973), which assumes that some firms have higher performance than others in terms of profit as a result of superior efficiency (lower marginal costs). The main idea behind the Boone indicator is the assumption that the impact of efficiency on performance increases as the market becomes more competitive. The indicator exploits the difference in bank's performance that results from difference in efficiency to measure competition. This method has five advantages that make it appealing. Firstly, it approaches the degree of competition in terms of the ability of banks to transform their price-cost margin efficiency in term of higher market shares. Secondly, it measures the evolution of competition over time rather than focusing on static analysis. Thirdly, it can be also apply for a given market at a sectorial level. Fourthly, it has a robust theoretical foundation as a measure of competition, meaning that it correctly depicts the level of competition both when competition becomes more intense through more aggressive interactions between firms and when entry barriers are reduced. Finally, it has the same data requirements as measures of competition based on PCM approach, namely the H-statistics and the Lerner index. For example, Schaek and Cihák (2014) show that the Boone indicator reflects more than 80 percentage of the information contained in other variables such as the H-statistic, government ownership of banks and the Financial Freedom index.

The goal of this paper is to use a new alternative well-grounded approach introduced by Boone (2008) to measure competition in the loan market in Albania. We proceed in three steps. First, we apply the parametric approach of the Boone indicator methods on bank-level data over the period 2002 - 2015, to which we draw conclusions on the degree of competition in the Albanian banking system. Second, we calculated the Lerner index. Finally, we take advantages of robustness check that includes alternative estimation approach to make a more reliable conclusion on the degree of competition in the Albanian banking sector.

The rest of the paper is structured as follows: Section 2 presents the methodology to calculate the Boone indicator. Section 3 discusses the main results with regards to Albanian banking sector. The material concludes in section 4.

2. METHODOLOGY

The fact that competition level is not observable has resulted in many different methods of measuring and estimating it. The two most used are the model of Panzar and Rose (1987) and the Lerner index. In addition to these already popular measures, an alternative measure of competition as proposed first by Boone (2004) and further developed by Boone (2008) measures the impact of efficiency on performance in terms of profit. The idea of this profit-elasticity index, which is also referred to as the Boone indicator (β), rests on the assumption that banks with superior efficiency, i.e. banks with lower cost, gain more benefits in terms of profit as a result of market share reallocation from less efficient banks to more efficient one and this effect becomes stronger

in a highly competitive market structure. This means that in a more competitive market banks sacrifice more for being in a cost disadvantage position. Put differently, banks are punished more harshly in terms of profits for cost inefficiency. Therefore, the stronger this effect is, the larger in absolute value β will be, which is also an indication of more competitive conditions in that particular market. In the empirical application, the simplest equation to identify the Boone indicator, for bank i at time t is defined as follows:

$$ln(\pi_{it}) = \alpha + \sum_{l=1...T}^{L} \beta ln(MC_{l,it}) + \sum_{k=1}^{K} \omega \lambda_{k,it} + \varepsilon_{it} \quad (1)$$

where π and MC denotes the profit and the marginal cost for banks (proxy efficiency) of bank i at time t respectively; α is the bank fixed effect; λ is a set of control variable associated with the coefficient ω; ln is the log-linearized transformation of the variables; and is an idiosyncratic shock. The market equilibrium condition is E = 0. The E-statistic is $\sum_{l=1}^{L} \beta$, which gives the profit elasticity, that is, the percentage change in profits of bank i as a result of a percentage change in bank i's costs. This indicator in theory is expected to have a negative value, i.e. the increase in costs reduces profit, which can be interpreted as a reduction in the ability of the bank to affect its losses due to an increase in competition.

Theoretically, efficient banks may choose to translate lower costs either into higher profits or into lower output prices in order to gain market share. As a consequence, using this measure for analysing competition in the banking sector, some researcher[6] transform the formula of Boone indicator and replace the value of profit with a bank market share, as follows:

$$ln(MC_{it}) = \alpha + \sum_{l=1...T}^{L} \beta ln(MC_{l,it}) + \sum_{k=1}^{K} \omega \lambda_{k,it} + \varepsilon_{it} \quad (2)$$

Where, MS is the market share of bank i at time t. In addition, as in the case of the Lerner index, Boone indicator require in its calculation an estimation of the marginal costs, which, based on Fiordelisi and Mare (2014) and Dushku (2015), is estimated through the trans-log cost function (TCF), as follows:

$$lnTC = \alpha_0 + \alpha_1 lnQ_{it} + 0.5\alpha_2 (lnQ_{it})^2 + \sum_{j=1} \beta_j ln_{itj} + \sum_{j=1}^{3} \sum_{k=1}^{3} \theta_{jk} lnP_{itj} * lnP_{itk} + \sum_{j=1}^{3} \gamma_j lnQ_{it} * lnP_{itj} + \tau_1 Trend + 0.5\tau_2 (Trend)^2 + \tau_3 Trend * lnQ + CRISIS + \varepsilon_{it} \quad (3)$$

Where, TC is the total costs of bank i at time t, Q is bank output, P is a vector

[6] *Van Leuvensteijn, et. al., (2011), Tabak, et. al., (2012), Van Leuvensteijn, et. al., (2013).*

of input prices, namely labour price (P_1), price of borrowed funds (P_2) and capital price (P_3), *Trend* is a time trend capturing the dynamics of the cost-function (efficiency) over time, *CRISIS* is a dummy variable to account for the effect of the global financial crises, which takes a value of 1 during the GFC and 0 otherwise, and α, β, θ, γ and τ are coeeficients to be estimated. ε_{it} is a two-component error term computed as follows:

$$\varepsilon_{it} = \mu_{it} + \omega_{it} \tag{4}$$

Where, ω_{it} is a two-sided error term, and μ_{it} is a one-sided distribance term representing inefficiency. Then, from Equation (3), assuming that inputs' prices are homogeneous, the marginal cost can be derived as follows:

$$MC = \frac{\delta TC_{i,t}}{\delta Q_{i,t}} = \frac{TC_{i,t}}{Q_{i,t}} \left[\alpha_1 + \alpha_2 ln Q_{it} + \sum_{j=1}^{3} \hat{\gamma}_j ln P_{i,t_j} + \hat{\tau}\, Trend \right] \tag{5}$$

The cost function must be homogeneous of degree one in input prices which imposes some restrictions on the parameter estimates. Linear homogeneity means that the percentage increase in all the three input prices raises the value of the cost by that same proportion. This property implies that the value of the three inputs included in the cost function represent the total cost. The linear homogeneity in input prices property requires the following restrictions on the parameter estimates to hold:

$$\sum_{j=1}^{3} \theta_j = 1 \tag{6.1}$$

$$\sum_{j=1}^{3} \beta_j = 0 \tag{6.2}$$

$$\sum_{j=1}^{3} \sum_{k=1}^{3} \theta_{jK} = 0 \tag{6.3}$$

For the research purpose we estimate Boone indicator, using both Equation (1) and Equation (2). However, the former is operationally impossible due to the negative net income generated by some of the banks operating in the Albanian banking system in 2008-2010. To overcome this problem the value of the bank profit is replaced by the volume of net interest profit. Then, Eq. (1) and Eq. (2) are often run by using the Ordinary Least Square (OLS) approach with random effects.

3. DATA

The data is taken from a dataset gathered and complied by the Bank of Albania. The strength of the dataset is its sample coverage and reliability of information. It covers all banks operating in Albania in the last two decades. The sample consists of 960 observations for 16 banks operating in Albania, since 2001 Q1. TC is the sum of personnel expenses, other administrative expenses and other operating expenses. The bank's single output, Q, is proxy by bank total assets. P1 is calculated as the ratio of personnel expenses over total assets. P2 is the ratio of other administrative expenses plus other operating expenses over total fixed assets. P3 is the ratio of interest expenditure over the sum of total deposits. CRISIS takes the value of 1 during the period 2008 Q03 – 2010 Q04, and 0 otherwise. All variables are log-linearized, besides the CRISIS.

4. RESULTS

A. MARGINAL COSTS

The estimation of the Boone indicator requires the computation of the marginal cost of each bank over the years. That is we estimate the TCF as presented by Equation (3). For this purpose we use the explanatory variables described in Section 2, namely bank output, input prices and the control variables. The model is estimated through the Ordinary Least Squares (OLS) approach with panel data[7]. The results of the estimated TCF model are presented in Table 1. The specification of the TCF model in the logarithmic form allows interpreting the first-order coefficients as cost elasticities. Most of the parameters have the expected sign and are statistically significant at conventional level, suggesting their impact on the cost estimation. This means that cost function gives good fit to the data and more precise estimates of marginal cost is expected. There the marginal cost is computed by substituting parameter estimates from the TCF into Equation (2).

The dynamic patterns of the marginal costs during the sample period are shown in Graph 1 in Appendix. Figure [a] shows the marginal costs level with regards to the banking system, large banks and small banks[8]. By contrast, Figure [b] on the right, presents the results on MC in which banks are aggregated similar to the approach that the Bank of Albania uses in its Financial Stability and Supervision Annual Reports[9]. Similarly, the other Figures (respectively [c] and [d]) show the price level patterns. A very distinct pattern, observed also by Dushku (2015), is that the privatisation of the largest banks (Saving Banks) in 2004 has been associated with a significant increase in the marginal cost. Small banks, especially those that are part of G1, seem to have

[7] *Among others Van Leuvensteijn, et al., (2011) uses also the OLS approach.*

[8] *The results are aggregated using a simple average approach.*

[9] *This approach is based on the market share banks hold in terms of assets and divides them into three main groups, namely G1 (banks with market share 0 < MS < 2%), G2 (banks with market share 2% < MS < 7%), and G3 (banks with market share 7% < MS).*

been effected mostly as results show a higher level of MC for these banks. Large banks seem to have experienced lower and more stable marginal costs. These developments have also been reflected at the price level. This is mainly explained by the Supervisory Council Decision No. 3 of 26.01.2005, where the minimum level of the required and paid-in capital for opening a bank rose from ALL 700 million to ALL 1 billion, whereas for the existing banks the fulfilment of the new required level was asked to fulfilled within a three-year period, according to terms specified in this decision. This finding can also be attributed to the fact that small banks operate mostly with retails banking, e.g. individuals and small and medium enterprises. Therefore, the establishing cost and the marginal cost could be high given the small scale of market in which they operate. By contrast, on average banks seems to have managed to reduce marginal costs sharply during the period 2004 – 2008, in particular those banks that are part of G1 and G2. However, it is also clear that there is a tendency which shows that marginal costs are gradually increasing especially after the global financial crises. In fact, among the banks, G2 that has experienced a relatively higher increase of the marginal cost, while G1 has managed to reduce cost even below the levels of G3.

B. BOONE INDICATOR

In this section, we proceed to the estimation of the Boone indicator (β) based on the relationship between efficiency and market share of individual banks as specified in Equation (2). The model is estimated, yet again, through means of the OLS approach with panel data. The results are presented in Table 2 in Appendix. The parameter indicates a relatively small standard error, which suggests that there was a small variation in the degree of competition in the banking system over the sample period. At the same time, as expected has a statistically significant negative sign. This indicates that the efficient-structure hypothesis and the competitive bank behaviour hold and that, ceteris paribus, banks in Albania can gain higher market shares as competition among them increases.

Furthermore, we use these results to calculate the Boone indicator for each bank over the period 2002 – 2015, to which we follow a two-step strategy. First, the estimated Boone indicator is transformed between the values [0,1] using exponential transformation [1/(1+exp(-Z*)]. Therefore, higher values of Boone indicator are associated with high degree of competition in the banking sector, and vice versa. Second, all individual scores are then aggregated as previously using the simple average approach. Figure 2.a.1 (Graph 2 in Appendix) reports the degree of competition for the banking system according to the Boone indicator. Similarly, Figure 2.b.1. shows such developments according to the Lerner Index[10]. Results reveal that overall there is a high level of correlation between Boone indicator and MC or/and P. They show that Boone indicator decreases as banks become less efficient, and vice versa.

[10] *Following Fiordelisi and Mare (2014) and Dushku (2015) we calculated the Lerner index as* $LER_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}}$. *The index is a linear straight forward indicator that takes the value between 0 and 1, with lower value indicating greater degree of competition. See also Dushku (2015).*

For example, Boone indicator exhibits a lower value during the period of the privatisation of the Saving Bank. Similarly, it scores also a higher value during the period 2005-2008, mostly due to improving PCM efficiency as competition among banks has been increasing, which is also confirmed by the Lerner index. Surprisingly, the value of Boone indicator stands, however, at a relatively lower level, thereafter the GFC, which is also associated with relatively lower PCM. This means that there is a lower degree of competition after this period and banks are on average loosing market shares for being all less efficient. This is confirmed also by the Lerner index, which shows that competition decreases especially after 2012 mainly due to the tendency that P has adjusted faster that the MC[11]. Similarly, results in Graph 3 [a] to [d] in Appendix show that Boone indicator has a reverse relationship with the Lerner index and the concentration ratio, measured through the Herfindahl-Hirchman Index (HHI)[12]. The intuition of the underlying results reveals three important factors. First, this analysis confirms the efficient-structure hypothesis in the case of Albanian banking sector. This means that banks would get more market share in return of a higher competitive behaviour. Second, increasing degree of competition is among the main factors that contribute to the diminishing level of market concentration. Finally, at an average value above 0.6 and 0.22, the Boone indicator and the Lerner index suggest that the competition of banks in Albania stands between the complete competition and the monopolistic one.

Furthermore, as we discussed earlier, Graph 4 in Appendix shows also the degree of competition among different groups of banks, i.e. large and small banks [Figure (a)] and G1, G2 and G3 [Figure (b)][13]. Overall, large banks, G3, seems to have operated in a stronger competitive environment than the other two groups prior to the GFC, which is also reflected at the higher market share that this group of banks have experienced. By contrast, G1 seems to have performed relatively better than G2, in particular after 2010, for which they have gained more market share. Therefore, to these results, two elements are worth mentioning. First, G3 has been at a constant manner more able to achieve most market share for being more efficient. Second, the competition of G1 may face other banks, in particular G2, to behave more competitively.

C. ROBUSTNESS CHECKS

In this section we present a range of robustness checks. First, we analyse the degree that a positive episode of competition is associated with a positive episodes in terms of higher market share. Results in Table 4 in Appendix report that in the case of banking system as a whole nearly 48% of PCM patterns correlate with those of market shares. The degree is higher for G2 and the

[11] *By contrast, this is also the period which saw non-performing loans increasing*

[12] *The index is defined as* $HHI_{it} = \sum_{i=1}^{N} MS_i^2$. *It can range from 0 to 1.0, moving from a huge number of very small firms to a single monopolistic producer. Increases of the index generally indicate a decrease in competition and an increase of market power, and vice versa. See also Dushku (2015 and Shijaku (2016a).*

[13] *The results are aggregated using the simple average approach, which banks are given equal weights.*

lowest is for G1. Out of these episodes nearly 45% appear to have accrued on the positive side. That is that lower PCM have been associated with higher market share. Among the banks, G1 seems to have benefited more to the advantages of lower PCM, while both G2 and G3 seems to have lost out some market share position for being inefficient. The tendency is higher after the global financial crises, which explains why and yet again confirms that G1 has gain more market share due to lower PCM. To that, G2 is also most penalised out of these patterns. However, at a ratio of 48% for the whole periods, these results confirm that most of the market developments happen to accrued out of the PCM related factors.

Furthermore, we extent our analysis in terms of changing the estimation approach and extending the TCF model by including an extra explanatory variable[14]. On the one hand, since the TCF model includes a large number of explanatory variables, it is highly likely that OLS will produce imprecise parameter estimates resulting from the multicollinearity problem. As an alternative, we follow Schaeck and Cihak (2014) to re-estimated Equation (3) by means of the General Method of Moments (GMM) as suggested by Arrelano and Bond (1991) and Arellano and Bover (1995) to control for endogeneity among the variables. The instrument variables include price inputs (namely P1, P2, P3) with up to 4 lags. Diagnostics check and the results of the Probability of the J-Statistics support the model specification approach, which all together with other results are presented in Table 6 in Appendix. We also re-estimated Equation (2) to calculate the Boone indicator. On the other hand, we follow also Leon (2014) and re-specify Equation (3) to include also additional control variable, namely bank capital. The specified model is expressed as follows:

$$\begin{aligned} ln\,TC_{it} = {} & \alpha_0 + \alpha_1 lnQ_{it} + 0.5\alpha_2 (lnQ_{it})^2 + \sum_{j=1}^{3} \beta_j lnP_{itj} \\ & + \sum_{j=1}^{3}\sum_{k=1}^{3} \delta_{jk} lnP_{itj} * lnP_{itk} + \sum_{j=1}^{3} \gamma_j lnQ_{it} * lnP_{itj} \\ & + \tau_1 Trend + 0.5\tau_2 (Trend)^2 + \tau_3 Trend * lnQ \\ & + \omega_1 lnE_{it} + 0.5\omega_2 (lnE_{it})^2 + \omega_3 lnE_{it} * lnQ + CRISIS + \varepsilon_{it} \end{aligned} \quad (6)$$

Where, E_{it} is total equity of bank i at time t. This model is estimated through the OLS approach. Then, assuming that inputs' prices are still homogeneous, Equation (4) is re-expressed as follows:

$$MC = \frac{TC_{i,t}}{Q_{i,t}} \left[\hat{\alpha}_1 + \hat{\alpha}_2 lnQ_{it} \sum_{j=1}^{3} \hat{\gamma}_j lnP_{itj} + \omega_3 lnE_{it} + \tau_3 Trend \right] \quad (7)$$

[14] *The results are provided upon request.*

The most important findings, as reported in Table 5 in Appendix, is that the correlation between marginal costs calculated based on different approach have a relatively high level of correlation, which is also statistically significant. This means that changing methodology and augmenting the TCF model does not change the results and that banking sector in Albania exhibits competitive patterns.

5. CONCLUSIONS

The study of competition is hampered by the scarcity of appropriate data and, in particular, by the lack of good indicators for the competitive environment that have wide coverage. Therefore, this paper aims to empirically assess the competitive structure of the Albanian banking sector over the period 2002 – 2015, with the objective to quantify the extent to which higher degree of competition among banks helps them to get higher market share. For this reason, it uses an alternative measure such as the Boone indicator, which to our best knowledge is the first study that applies this approach in the case of Albania.

The main results can be summarised as follows. First, our results show that the HHI, the Lerner index and the Boone indicator produce relatively similar patterns of competition over time. All of them suggest that banks in Albania operate in a competitive environment over the sample period. These indicators provide supportive evidence that banking sector in Albania is more closely related and characterised as a competitive market rather than monopolistic one. Second, an increase in the market power of the bank at the level of individual institution, measured through the Lerner index tend to lower the degree of market concentration. Similarly, Boone indicator indicates that a greater degree of competitions by banks and improving price-to-cost margins go hand-to-hand with higher market share. Overall, both indicators suggest that market power has increased over time, while recently patterns of the degree of competition may not be linked to PCM factors, but rather may be due to their changes in strategies. Turning to competition among different scale of banks, we found that small banks exhibit a higher degree of competition than larger banks, to which they have achieved to gain more market share, especially after 2010.

Finally, like other approaches, the Boone indicator is a simplification of the reality and suffers from some limitations. First, efficient gains may not be translated into lower prices or higher profits in short-term. This suggests thatbanks use such gains in order to cope with competition in the future, even though as Van Leevensteijn, et al., (2011) these distortions are more likely to happen when the Boone indicator is assessed year by year rather than estimators covering the full sample period. Second, as Leon (2014) reveals, the Boone parameter, β, is expected to be negative but may be positive if banks compete in quality. Using costs is the simplest way to capture difference in efficiency as in markets where suppliers offer heterogeneous goods, changes in costs may merely reflect changes in strategies. Banks offering the most demanded products may not only yield more profit but also spend more. In such cases identification becomes impossible.

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APPENDIX

Table 2. Results of the estimated TCF model for the banking system in Albania.

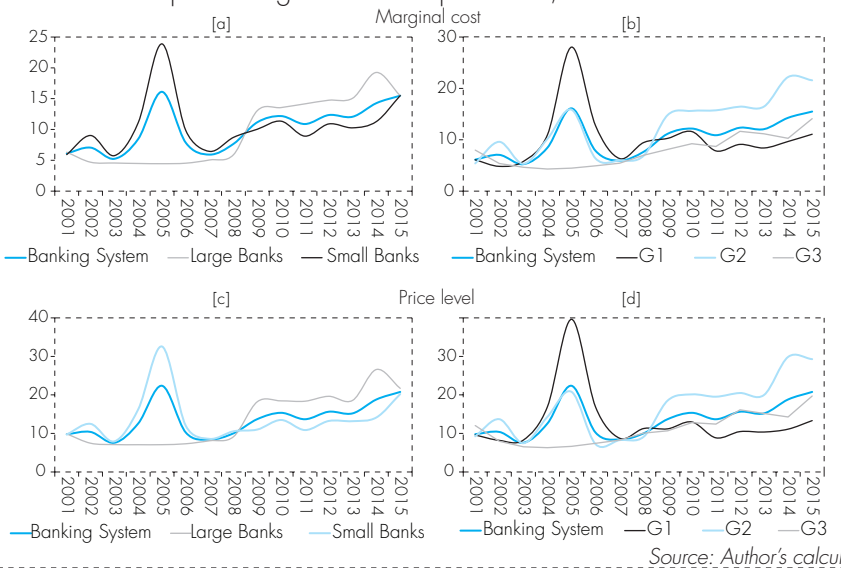
Dependent Variable: TC
Method: Panel Least Squares
Sample: 2006Q1 2015Q4
Periods included: 37
Cross-sections included: 16
Total panel (balanced) observations: 592

TC=C(1)+C(2)*Q+0.5*C(3)*Q^2+C(4)*P1*P2+C(5)*P1*P3+C(6)*P2*P3+C(7)*Q*P1+C(8)*Q*P2+C(9)*Q*P3+C(10)*CRISIS+C(11)*TREND+0.5*C(12)*TREND^2+C(13)*TREND*Q

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-1.841582	0.070474	-26.13149	0.0000
C(2)	0.702095	0.013465	52.14134	0.0000
C(3)	0.012003	0.001404	8.548697	0.0000
C(4)	0.125376	0.005900	21.24969	0.0000
C(5)	-0.005697	0.001702	-3.346970	0.0009
C(6)	0.008747	0.000853	10.24833	0.0000
C(7)	-0.016883	0.001523	-11.08201	0.0000
C(8)	0.086373	0.000322	267.8648	0.0000
C(9)	-0.002241	0.000210	-10.66969	0.0000
C(10)	0.007338	0.003034	2.418254	0.0159
C(11)	0.003709	0.001219	3.043121	0.0024
C(12)	7.74E-06	2.57E-05	0.301182	0.7634
C(13)	-0.000390	8.56E-05	-4.549645	0.0000
R-squared	0.999681	Mean dependent var		8.141240
Adjusted R-squared	0.999674	S.D. dependent var		1.512308
S.E. of regression	0.027303	AIC		-4.341939
SSR	0.431612	SIC		-4.245680
Log likelihood	1298.214	HQ		-4.304445
F-statistic	151054.4	DW statistic		0.508758
Prob(F-statistic)	0.000000			

Source: Author's Calculations

Graph 1 Marginal cost and price level, 2001 – 2015



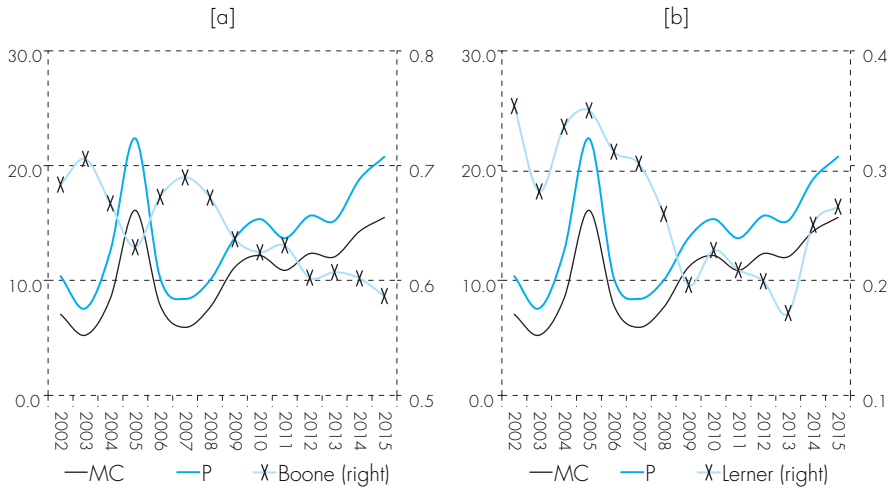
Source: Author's calculations.

Table 2. Results of the estimated Boone indicator, for loan market in Albania.

Dependent Variable: MS				
Method: Panel Least Squares				
Sample: 2004Q1 2015Q4				
Periods included: 48				
Cross-sections included: 16				
Total panel (unbalanced) observations: 759				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.529876	0.177257	8.630823	0.0000
MC	-0.224535	0.076630	-2.930128	0.0035
CRISIS	0.017707	0.142024	0.124679	0.9008
R-squared	0.011254	Mean dependent var		1.049670
Adjusted R-squared	0.008635	S.D. dependent var		1.602471
S.E. of regression	1.595538	AIC		3.776248
SSR	1922.034	SIC		3.794576
Log likelihood	-1428.198	HQ		3.783307
F-statistic	4.296927	DW statistic		0.021330
Prob(F-statistic)	0.013945			

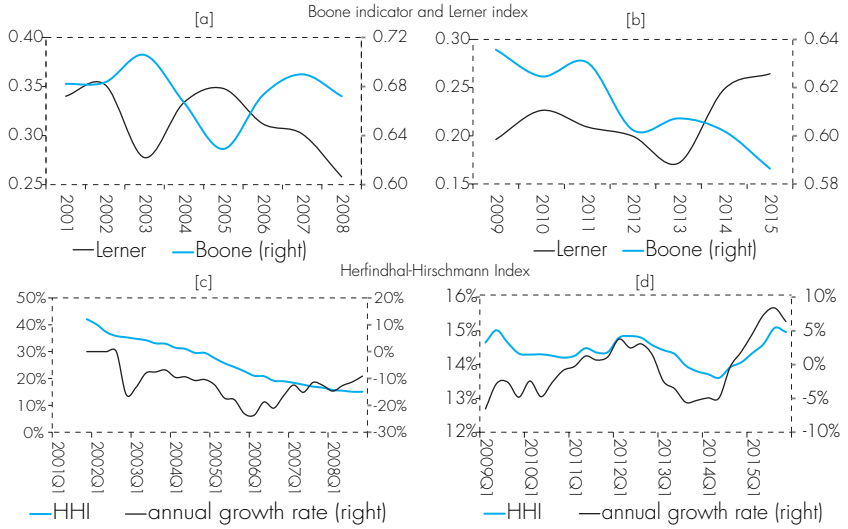
Source: Author's Calculations

Graph 2. Boone indicator and the Lerner Index for the period 2002 – 2015.



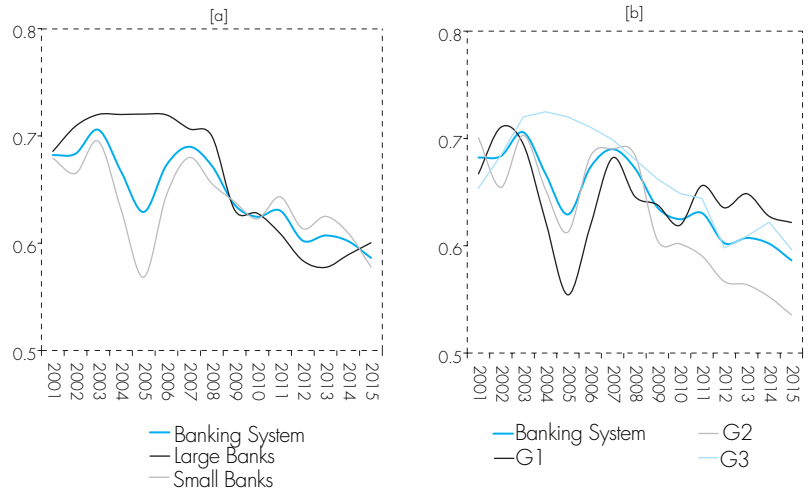
Source: Author's calculations.

Graph 3 Competition and concentration in Albanian banking system, 2002 – 2015



Source: Author's calculations.

Graph 4 Boone indicator and the Lerner Index for the period 2002 – 2015.



Source: Author's calculations.

Table. 4. Probability of co-movements between Boone indicator and Lerner index.

Bank	2001 - 2015				2001 - 2008				2009 - 2015			
	Number of Episodes (%)				Number of Episodes (%)				Number of Episodes (%)			
	Obs.	Total	(+)	(-)	Obs.	Total	(+)	(-)	Obs.	Total	(+)	(-)
BS*	802	48%	45%	55%	354	50%	50%	50%	448	46%	40%	60%
G1a	251	49%	41%	59%	111	47%	44%	56%	140	51%	41%	59%
G2b	301	51%	40%	60%	133	52%	58%	42%	168	50%	34%	66%
G3c	250	43%	56%	44%	110	51%	49%	51%	140	35%	63%	37%

*Banking System; [a] banks of Group 1; [b] banks of Group 2; [c] banks of Group 3

Source: Author's Calculations

Table 5. Covariance and Correlation Analysis

Sample: 2001Q4 2015Q4 Included observations: 817 Balanced sample (list-wise missing value deletion)			
	MC	MC 'a'	MC 'b'
MC	0.43		
	(1.0)		
	[—]		
MC 'a'	0.46	0.52	
	(0.98)	(1.0)	
	[131.3]	[—]	
MC 'b'	0.53	0.67	1.26
	(0.72)	(0.83)	(1.0)
	[29.6]	[42.1]	[—]
Covariance (Correlation) [t-Statistic]			

Source: Author's Calculations

A STATISTICAL EVALUATION OF GAP'S FORECASTING PERFORMANCE FOR THE ALBANIAN ECONOMY

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January 2017

1. INTRODUCTION

The forecasting accuracy of economic projections is always a matter of primary importance in central banks when it comes to models used for policy-making purposes. Ability of models to read and predict eventual economic conditions deterioration becomes even more important in a time of unprecedented complex nature of crises and when unconventional monetary policy has become a viable option. Hence, having in place reliable economic forecasting models is of a paramount importance to properly orient the policy-making debate around crucial issues needed to be tackled appropriately by the decision-makers. In this light, the prepared discussion material tends to actively contribute in understanding the accuracy of the GAP model forecasting performance aiming critically consider the present stance of the model and think potential perspectives to consider potential future improvements and model expansion in order to properly resemble the Albanian economy.

GAP is one of the two core economic models used in the Bank of Albania to make projections on future developments of the Albanian economy, the later being taken into account during policy-making debates in the Bank of Albania. A small New Keynesian structural model, introduced first by Dushku and Kota (2011), the GAP is constructed in four building blocks representing aggregate demand, inflation, exchange rate and the interest rate policy rule. The model works with quarterly data flow variables and has an exogenously defined steady-state. The aim of our article is to evaluate whether this model constructed to replicate developments of the Albanian economy, by also capturing turning points and having reasonable impulse response functions to given shocks, performs accordingly with economic expectations in the present macroeconomic framework. We are going to statistically analyze the forecasting performance of the model and comparing it to the results obtained by a VAR, as a commonly used and accepted model to understand the data causal relationship and made projections, built to match the Albanian economy.

The article is structured as follows. Section 2 describes the data used for model estimation and variables transformations. Section 3 continues with the methodology utilized to deliver the statistical diagnostic analysis, including the construction of the VAR model. Section 4 discusses the empirical results obtained by the comparative analysis and the potential paths to be explored when thinking in eventual improvements of the GAP model. Final remarks are presented in Section 5.

2. DATA DESCRIPTION

In estimating the GAP model, we use quarterly data on real Gross Domestic Product (GDP), Consumer Price Index (CPI), nominal exchange rate ALL/EUR and monetary policy rate for the period 2002Q1 to 2015Q4. For updating the database with the latest available data, Institute of Statistics and Bank of Albania sources are utilized and the data are transformed accordingly, respectively data on GDP and CPI are taken from INSTAT, and those on interest rate and exchange rate from Bank of Albania. We have chosen 2002 as starting point of the sample period, because there are some structural breaks of the series in the previous years. Data on foreign variables are taken from the Eurostat database and the European Central Bank. Prior to estimation, real GDP, CPI and nominal exchange rate are transformed into quarter-on-quarter and year-on-year growth rates, approximated by the first difference of their logarithm. An extensive discussion of the empirical implementation of the GAP model is beyond the scope of this article, and the reader is thus referred to Dushku and Kota (2011) for details on the calibration of the model's steady state and the distribution of model parameters.

3. METHOD OF ANALYSIS

This section describes the methodology used in this article to evaluate the forecasting performance of GAP model. First, the accuracy and the biasedness of model forecasts were assessed using some statistical indicators and then the GAP model's forecasting properties were evaluated against a less theoretical oriented forecasting tool such as Vector Autoregressive (VAR) model.

3.1 ACCURACY

The accuracy of forecasts was measured using root mean squared errors (RMSE), defined as:

$$RMSE = \sqrt{\frac{1}{N} \sum_{i=1}^{N} e_1^2} \qquad (1)$$

where e_i is a forecast error, defined as outturn less forecast.

The larger forecast errors are, the larger are RMSEs, but the relationship is not linear. RMSEs will be disproportionately large (small) if errors are very large (small). RMSEs are a standard loss function used in the forecast evaluation literature. More importantly, a quadratic loss function is appropriate for our purposes because policymakers will care more about big forecast errors that could lead to big policy mistakes and have a damaging impact on the economy, than small errors, which may not impact much on policy. However, RMSEs represent one particular form of loss function (a quadratic loss function)

and alternative loss functions could lead to different results (Timmermann, 2006).

To allow comparability of RMSEs across variables, RMSEs are scaled by the standard deviation of the data outturns (over the same period as the RMSE was calculated). This is a simple way to account for data volatility, since greater volatility makes a given variable inherently more difficult to forecast. It is important to note that the value of the scaled RMSE is not itself informative (i.e. whether it is above or below one), and is only useful to compare with scaled RMSEs of other variables or of the same variable in other periods of time.

3.2 BIASEDNESS

Biasedness of forecasts was assessed using ordinary least squares (OLS) regression. Forecast errors were regressed on a constant with a null hypothesis that the constant was zero, which would be the case if the forecasts were unbiased. Otherwise, the forecasts could have been made more accurate by adding a constant amount to them. As in equation (1), forecast errors are defined as:

$$e^{t-h} = y - y_t^{t-h} \quad (2)$$

where y_t is the outturn of variable y in period t and $y_{t,t-h}$ is the forecast for variable y in period t made in period t-h.

To test for biasedness, the following regression is estimated:

$$e_t^{t-h} = \beta_0 - u_t \quad (3)$$

where U_t is a zero-mean error term. Under the null hypothesis of unbiasedness $\beta_0 = 0$. If $\beta_0 > 0$, forecasts have been systematically too low. If $\beta_0 < 0$, forecasts have been too high. We estimated the regression using OLS with Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors. Forecasts made in consecutive quarters will cover mostly the same forecast period and the associated forecast errors are therefore likely to be auto-correlated. Using HAC standard errors should account for this and other potential autocorrelation and heteroscedasticity issues (Andrews, 1991).

3.3 BENCHMARKING OF GAP FORECASTS

Comparing GAP' dynamic properties and forecasting accuracy with those of more data-driven benchmarks such as VARs can be helpful because DSGE models place a great number of restrictions on the time-series behaviour of the variables they seek to explain and forecast. Their size poses challenges to both estimation and specification analysis, which entails risks for the reliability

of their forecasts. VARs often provide a reasonably good fit to macroeconomic time series data (Domit et. al., 2016).

In this article, we introduce an unrestricted VAR with 4 lags with the same macroeconomic variables as GAP. As in the GAP model, we treat Albania as a small open economy and model the rest of the world as exogenous. We then assess the relative performance of both models in forecasting inflation, GDP growth and exchange rate growth. All the variables in the VAR are expressed as annual growth rates, which in addition avoids the need for seasonal adjustment for those who have a seasonal behavior during the year. Several diagnostic tests are performed to check for variables stationarity, model stability, autocorrelation, heteroscedasticity and normality of residual distribution. Test results suggest that the VAR model satisfies all the necessary assumptions of an OLS estimation procedure.

To reflect the information available at the time the forecasts would have been produced, both models are re-estimated between 2002 and 2015 using real-time data. The real-time estimation approach means that each forecast is produced only with information that would have been available at each forecast round (Iversen et al., 2014). The forecast performance of GAP is assessed using an extending procedure. The initial estimation period is 2002Q1-2009Q4 and it is gradually extended by four quarters. First, we estimate the parameters up to the fourth quarter of 2009 and then we compute out-of-sample forecasts for one year, two years and three years ahead. We extend the estimation sample by four quarters and then compute again the forecasts for one year, two years and three years ahead. We repeat this process several times until the end of the sample.

We then used a Diebold-Mariano test (Diebold, Mariano, 1995) to assess whether differences in accuracy (measured by squared forecast errors) between the GAP and VAR forecasts were statistically significant. To conduct this test, a difference in squared forecast errors for the forecasts of the two models is defined as:

$$d_t = e_{t,1}^2 - e_{t,2}^2 \quad (4)$$

where $e_{t,1}^2$ and $e_{t,2}^2$ are the squared forecast errors at time t respectively for the first and the second forecasting model.

The following equation is then estimated using Ordinary Least Squares (OLS) with HAC standard errors:

$$d_t = \beta_0 + u_t \quad (5)$$

where u_t is a zero-mean error term. The null hypothesis is that there is no difference in accuracy between the two forecasts, i.e. $\beta_0 = 0$. If $\beta_0 > 0$, the second model forecast has tended to be more accurate than the first one, and vice versa, if $\beta_0 < 0$.

For forecast accuracy comparison between GAP and VAR model, we use RMSEs. We first compared scaled RMSEs over different horizons and used Diebold-Mariano tests to assess whether differences in accuracy between GAP and VAR models were statistically significant. RMSEs are compared for each variable, scaled by the standard deviation of data outturns over the same period as we calculated the RMSEs. And again, Diebold-Mariano tests are used to assess whether differences in accuracy between GAP and VAR models were statistically significant.

4. ESTIMATED RESULTS

In this section we set out our main empirical findings. This section starts with the accuracy and biasedness of GAP forecasts across the three macroeconomic variables: inflation, real growth and exchange rate. We then compare the accuracy of GAP forecasts to forecasts from a VAR model. It is important to note that the relatively small sample size means that we need to interpret the results below with caution.

4.1 ACCURACY OF GAP FORECASTS

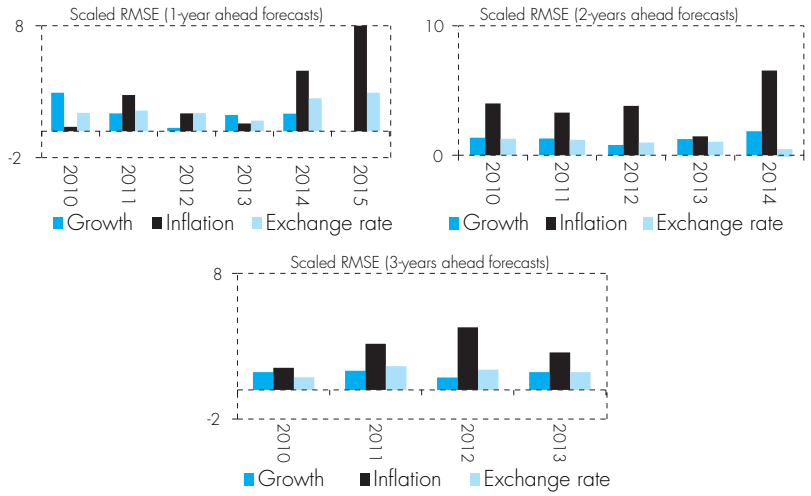
As described in the previous section, we measure forecast accuracy over a given period using RMSEs scaled by the standard deviation of data outturns over that same period. Scaled RMSEs for (quarterly) GAP forecasts at all three horizons are shown in Figure 1. As we noted before, the value of a scaled RMSE is not in itself informative, but we can compare the degree of accuracy across variables and across time periods. A higher scaled RMSE indicates that forecasts of a particular variable have tended to be less accurate, relative to the volatility of the data outturns.

For inflation, forecast accuracy tends to decrease as the forecast horizon expends, except for 2010. This result is reasonable as with the increase of forecast horizon, it is more difficult to predict the likely path of a given variable. For growth and exchange rate, the behavior of forecasts accuracy is more irregular: sometimes it increases, sometimes it decreases with the increase of forecast horizon, but scaled RMSE values remain low. Growth and exchange rate forecasts have tended to be the most accurate at all the forecast horizons, while inflation forecasts have tended to be the least accurate.

4.2 BIASEDNESS

Consistent with our measure of forecast accuracy, and in order to allow

Figure 1 Forecast accuracy for different time horizons.

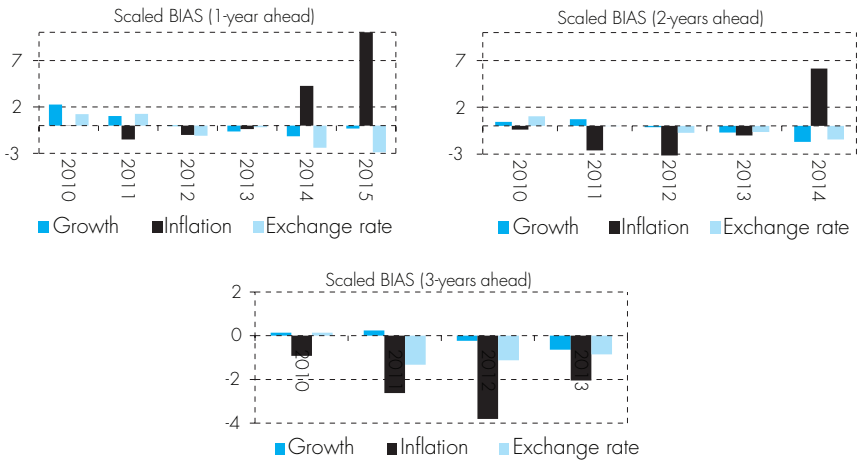


Note: The year in the horizontal axis means that the forecast sample starts from that year and the estimated sample is until the last quarter of the previous year.

comparability across variables and time periods, the estimated degree of bias in forecast errors (given by β_0 in equation (3)) are scaled by the standard deviation of the data outturns (over the same period as the bias was calculated). Inflation forecasts tend to be substantially biased for the years 2014 and 2015, which explains also the low scaled RMSE values for the same years. As scaled RMSE, forecast biasedness of inflation forecasts for the same estimated sample tends to decrease as the forecast horizon increase, except 2010. For growth and exchange rate the values of scaled bias are quite low.

Table 1 presents the estimated bias coefficients for GAP forecasts over different time horizons and their statistical significance. As it can be seen, there is statistically significant evidence of bias only for inflation forecasts at 10% level

Figure 2 Forecast biasedness for different time horizons.



Note: The year in the horizontal axis means that the forecast sample starts from that year and the estimated sample is until the last quarter of the previous year.

for the 3-years ahead horizon. Relative to data outturns, growth forecasts have

tended to be high during all the forecast horizons. Exchange rate forecasts have been lower for 1-year and 2-years ahead horizons and higher during 3-years ahead horizon. Inflation forecasts have been lower for the 1-year ahead horizon and higher for 2-years and 3-years horizons, but only the coefficient of latest is statistically significant at 10%. The estimated (scaled) bias coefficient for inflation forecasts was the largest at the three years period, followed by growth bias in the 3-years ahead horizon and exchange rate bias in the 2-years ahead horizon.

Table 1. Statistical significance of bias coefficients.

	Growth	Inflation	Exchange rate
1-year	-0,299	0,199	0,258
2-years	-0,291	-1,057	0,336
3-years	-0,406	-1,347*	-0,228

*Note: *significance at 10%.*

4.3 COMPARISON BETWEEN GAP AND VAR FORECASTS

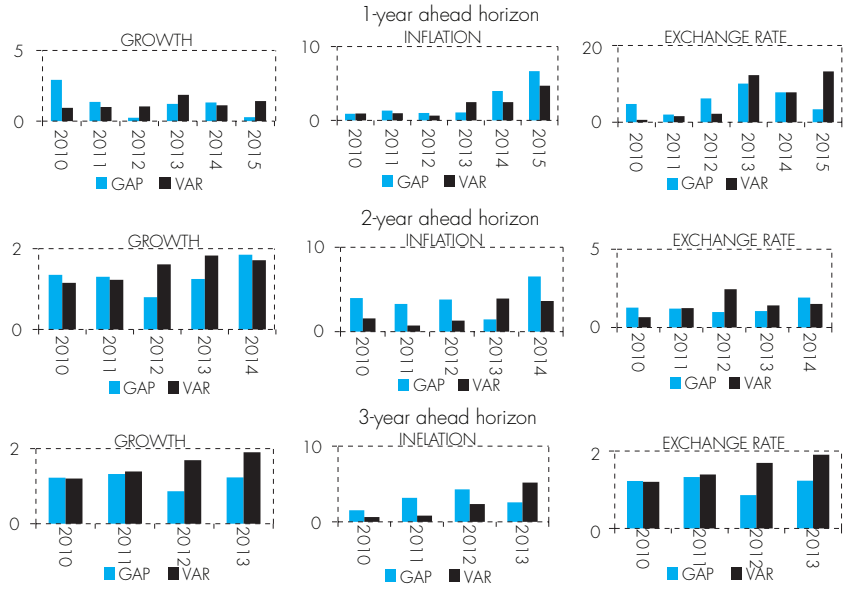
4.3.1 ACCURACY OF GAP FORECASTS

As discussed in the previous section, we benchmarked the accuracy and the biasedness of GAP forecasts against a simple VAR model. From Figure 3, it is possible to notice that the GAP model systematically outperforms the VAR model when it comes to forecasting exchange rate trends in one, two and three years ahead forecast horizon. In terms of accuracy of forecast for inflation, the VAR model outperforms the GAP model in the three time horizons of the forecast on which the analyses has been developed. GAP forecasts have lower Scaled RMSEs compared to VAR even for growth.

4.3.2 BIASEDNESS OF GAP FORECASTS

Forecasts obtained for growth and exchange rate with the GAP model are

Figure 3 Scaled RMSE in one, two and three years horizons.

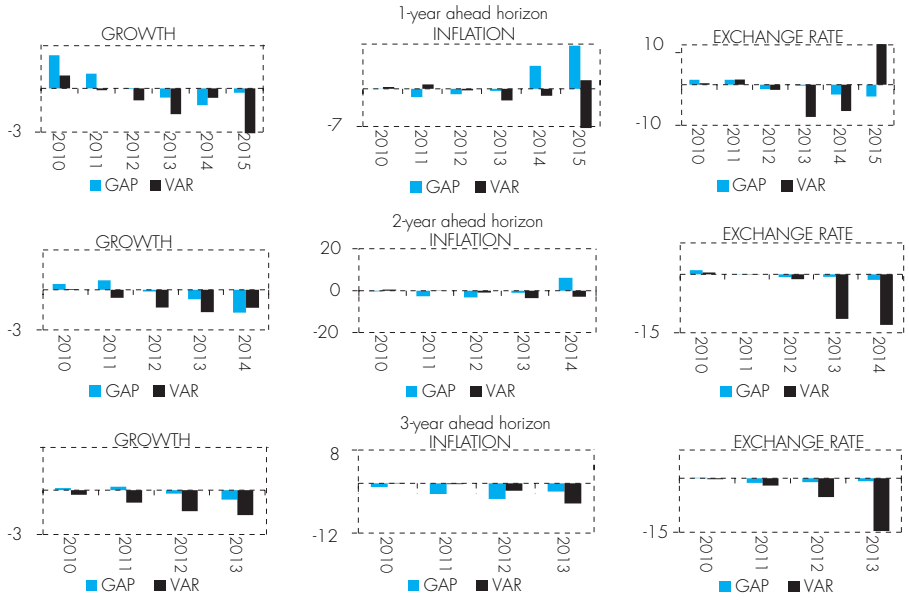


slightly biased, very close to zero for all time horizons, while the same cannot be said for the VAR model. In one year time horizon the GAP results are less biased than those obtained by the VAR.

Persistently, the VAR forecasting results are negatively biased for all the variables. While significantly less biased than the VAR forecasts for Growth and inflation, the GAP forecasts in time horizons four and eight quarters ahead are negatively biased. Results obtained for Inflation by the VAR in eight and twelve quarters ahead are less biased than those obtained by the GAP. In terms of biasness the GAP outperforms the VAR significantly when it comes in predicting Growth in one, two and three years ahead time horizons. GAP forecasting outputs are less biased when run in four quarters ahead horizon, outperforming the VAR in comparative terms.

4.3.3 DIEBOLD-MARIANO TEST

Figure 4 Scaled BIAS in one, two and three year horizons



We conducted Diebold-Mariano test according to the steps described earlier, to test whether there are differences in the accuracy of model forecasts and we get the following results:

Table 2. Diebold-Mariano test results.

	GROWTH	INFLATION	EXCHANGE RATE
1-YEAR	-1.442217	1.070123*	-90.2
2-YEARS	-3.139118	4.006239*	-30.78867*
3-YEARS	-3.143100	1. 354761	-35.85594*

*Note: *significance at 10%.*

Among the coefficients above, only those for inflation and for exchange rate in the respective horizons are significant. The results suggest that VAR outperforms

GAP model significantly for inflation forecasts for 1-year and 2-years horizons, but it has a worse performance when it comes to the exchange rate for 2 and 3-years horizons. Regarding growth forecasts, there are no statistically significant differences between the two models. Even though, we should be cautious when interpreting the results because the small sample affects results reliability. An outcome difficult to be predicted may affect substantially the RMSE estimates and forecast accuracy in short horizons, meanwhile in longer horizons its effect is insignificant.

5. CONCLUDING REMARKS

This article provides a methodology to evaluate the forecast performance of the GAP model in several statistical diagnostic aspects, including benchmarking its performance against a VAR model. This section tries to draw some concluding remarks based on key results obtained from the forecasting comparative analysis and sets out some recommendations to improve particular aspects of forecasting performance.

Different performance measures suggest that the forecast ability of the GAP model is moderate and there is still room for further improvement in its structure. Specifically, GAP model estimates show that the model forecasts for economic growth and the exchange rate are relatively better than medium-term inflation forecasts. Benchmarking with an alternative data-driven model, thus excluding the expert judgment, shows that the model can be improved through better identification of the structure and parameters that define inflation in the model. This brings to attention the need for better identification of the inflation determinants in the model, contributing to the accuracy of projections used in the design of monetary policy.

The need to increase the accuracy of GAP model predictions should serve as an incentive for further and deep research work that focus on improving the projections derived from the model, periodical recalibration of the parameters to reflect changes in the economy, as well as the enrichment with other possible blocks as effective paths toward better inclusion of policy oriented expert judgment in the model.

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INTERPRETING THE ALBANIAN LEK EXCHANGE RATE FLUCTUATIONS DURING THE FINANCIAL CRISIS: EVIDENCE FROM REAL TIME DATA

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INTRODUCTION

Interpretation of exchange rate volatility in the light of economic fundaments represents a main issue of interest for policy-makers when it comes to monetary policy implementation. Central bank interventions are often necessary to smooth the undesired volatility, on the scope of protecting the economy from short-term high volatility and long-term "oscillations" that are skewed from the "fundamental" equilibrium. Managing the Foreign Reserve and interventions in the monetary market to mark its level constitute a continuous process that requires increased effectiveness.

Economic agents are exposed to the indirect credit risk caused by sudden unpredictable fluctuations of exchange and interest rates. Financial stability reports by the Bank of Albania repeatedly emphasize that although the biggest part of the credit unhedged against the exchange rate risk is backed by collateral, deterioration of its quality represents a problem that should be monitored, in order to identify causes and evaluate future expectations. Understanding the impact of economic news and relevant information on lek exchange rate against the two hard currencies, euro and US dollar, would serve to better orient market actors in their positioning on time, forerunning and averting potential distortions that stem from high volatility in forex markets. Theory suggests that despite the argument that currency volatility permits the economy to absorb different shocks, in a long-term horizon, the exchange rate will reflect economic fundamentals. Agents position themselves in markets basing on their expectation on future economic developments in relation to economic fundamentals announcements. High volatility in the forex market increases risk that stems from instability of exchange rate in economy, highlighting the importance of decision-making efficiency and dedicating attention to interpreting the exchange rate as a function of economic fundamentals.

According to Vika (2016) non-linear estimations widely confirm empirical findings that repeated deviations of exchange rate in the same direction could attract the attention of central bank decision-makers. However, decisions to intervene are deeply discouraged in days of high exchange rate fluctuations, implying in this way a considerable valuation of lek being perceived as its' price movement towards a new equilibrium. Very high fluctuations would make the central bank hesitant to intervene in the market, and as a consequence more prudent on the optimal evaluation of intervention time depending on exchange rate oscillations.

In the effort to interpret exchange rates sensitivity on news related to economic fundamentals, our study intends to analyse the impact of main economic news over the exchange rate, considering as news or "surprise" every deviation of the announced value from the expected value for each of fundamental economic indicators in focus of our analysis. Considering currency as an indicator of economic situation and trying to understand factors that determine lek exchange rate against euro and US dollar, we focus our analysis on the Albanian economy, Eurozone and US economy treating as positive economic news, announcements over fundamentals that create a positive market perception, the latter being reflected in an appreciation of the national currency. Meanwhile, as negative economic news are identified developments that due to negative perception from market agents are followed by a devaluation of the national currency against euro and US dollar. Our analysis is based on the inter-day exchange rate that allows to understand more clearly the persistence of the impact of news on economic fundamentals on determining the exchange rate value of lek.

Economic thought of recent years has evolved bringing in literature development of two main approaches in analysing and interpreting the exchange rate course: technical analysis and fundamentals analysis. As treated from Allen and Taylor (1990); De Grauwe and Dewachter (1993) and Cheung and Chinn (1999) technical analysis has a specific importance to understand major fluctuations or over appreciation of currencies in cases when market actors follow technical trading rules in the forex market, not taking economic fundamentals as a reference for the analysis. Later, Evans and Lyons (2002) argument that in short-term horizons the exchange rate is oriented by traded volumes, meaning supply and demand equilibriums in a specific moment of time in the forex market, determined by massive sales and purchases of currency from the side of agents. This reflects another mechanism for processing economic information far from the main economic fundamentals analysis. But, Love and Payne (2002) as Evans and Lyons (2003) find that are exactly economic fundaments those that determine a major part of traded volumes in currencies market.

To perform analysis, we have selected the most important economic fundamentals that literature considers as determinant in understanding exchange rate volatility and on their basis analysed the effects of economic news on the appreciation of lek against the two hard currencies, euro and US dollar. We aim to study the impact of economic news on the attitude of forex market agents and be able to understand how their positioning varies depending on announcements dynamics over the fundamental macroeconomic indicators. As in Andersen, Bollerslev, Diebold and Vega (2003), Faust, Rogers, Wang and Wright (2003), Galati and Ho (2003) or Ehrmann and Fratzscher (2004) we use real-time data for all important macroeconomic announcements and monetary policy decisions in the US, Eurozone and Albania, in the quality of economic fundamentals. After creating the database with real-time data on a monthly and quarterly frequency, we test their impact on determining the daily exchange rate of lek with euro and the US dollar for the period January 2007

– July 2012. Forecasts taken from Bloomberg, FED's SPF1 and ECB as well as forecasts of the Bank of Albania for macroeconomic indicators in focus, allow us to understand real-time deviations from their predicted values, perceived by market participants as "economic news". Through this database, our study tries to provide reliable explanatory answers in interpreting exchange rate volatility of lek against the two hard currencies in the forex market, euro and US dollar.

DATA AND METHODOLOGY

DEFINING THE "NEWS"

In economic literature do exist many ways to define "news", basing on which economic research investigates their impact in the real economy. But, following the aims of this study we define "news" as the "surprise" measured by the difference between actual spot values of the macroeconomic variable on announcement day and the forecasted variable's value expected for that precise day. While the actual spot values of the macroeconomic variables are extracted from the official announcements released in the predicted days according to official announcements calendar, the expected market variable's value is taken from reliable and reputed institutional forecasters. Treating the currency market value as an indicator of state for country's economy and aiming to understand the lek exchange rate against the two main hard currencies, we focus our data research in three main economies, important to determine it, respectively Albania, the US and Eurozone. Once we obtained the full dataset of actual spot data and expected values for each variable, we analyse the effects of "surprises" on the exchange rates of that day or the successive one. In our analysis, we consider a positive "news", one which is perceived positively for the state of the economy by the market agents, leading thus to an appreciation of the national currency against other two other currencies in focus. On the other side, negative "news" is negatively perceived by market agents being reflected in a depreciation of the national currency. Detailed statistics about the economic "news" deriving from the macroeconomic announcements for the three economies could be found as following, Table 1 for the Albanian economy, Table 2 for the Eurozone economy and Table 3 for the US economy.

Table 1 Summary statistics for macroeconomic announcements, surveys, and surprises Albania

	Announcement		Survey		Surprise	
Albania Announcement	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
CPI YoY (%)	2.93	0.95	3.13	0.91	-0.12	1.10
GDP YoY (%)	3.10	2.67	2.41	1.80	0.69	2.84
Current Account YoY (%)	0.22	0.40	0.03	0.19	0.19	0.33
Trade Balance of Goods YoY (%)	9.14	17.23	2.78	6.24	6.65	16.24
M3 YoY (%)	10.96	3.47	10.27	3.16	0.69	2.98

Source: Bank of Albania, INSTAT, IMF Country Reports, Authors' calculations

[1] *Survey of Professional Forecasters*

Table 2 Summary statistics for macroeconomic announcements, surveys, and surprises Eurozone

	Announcement		Survey		Surprise	
Eurozone Announcement	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
ECB Ref. Rate 2-week	2.19	1.20	2.38	1.45	-0.19	0.31
Unemployment (%)	8.95	1.41	8.93	1.41	0.02	0.11
HICP YoY (%)	2.04	1.10	2.05	1.09	-0.003	0.05
GDP YoY (%)	0.53	2.48	0.57	2.47	-0.05	0.13
Retail sales MoM (%)	-0.14	0.54	0.10	0.34	-0.24	0.45
Industrial Production MoM (%)	-0.08	2.13	0.12	1.07	-0.20	1.63
PPI YoY (%)	2.62	4.20	2.65	4.18	-0.02	0.24
Trade Balance	871.6	5642.0	514.2	3922.6	357.4	3551.1
Ifo Business Climate Index	101.52	9.08	101.30	8.96	0.21	1.36
M3 YoY (%)	5.13	4.29	5.14	4.23	-0.01	0.48

Source: Bloomberg, ECB SPF, Reuters, Authors' calculations

Table 3 Summary statistics for macroeconomic announcements, surveys, and surprises US

	Announcement		Survey		Surprise	
US Announcement	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Fed. Funds Target Rate US	2.38	2.19	2.05	2.01	0.33	0.32
Consumer Confidence SA	63.41	21.58	21.14	63.78	-0.37	5.41
Housing starts	798.88	328.44	801.58	326.29	-2.70	57.06
Trade Balance	-47.45	10.58	-47.74	10.38	0.35	3.70
Retail sales MoM (%)	0.18	0.92	0.18	0.69	-0.004	0.56
PPI MoM (%)	0.28	0.99	0.21	0.65	0.07	0.50
Unemployment (%)	7.65	2.06	7.66	2.09	-0.01	0.17
Nonfarm Payrolls MoM (%)	-26.87	234.77	-14.80	233.51	-12.07	67.57
Industrial Production MoM (%)	0.05	0.77	0.12	0.50	-0.07	0.46
CPI MoM (%)	0.18	0.402	0.18	0.33	0.01	0.14
GDP Q/Q annual. (%)	1.42	2.74	1.45	2.87	-0.03	0.25

Source: Bloomberg, FED SPF, Reuters, Authors' calculations

METHODOLOGY

Aiming to understand and interpret the relevance of real-time data of fundamental indicators on exchange rates at a daily frequency, our empirical analysis uses lek – euro as well as lek – US dollar daily returns and real-time macrofinancial data during the period January 2007 -July 2012.

The real-time data consists of the data releases for important macroeconomic variables as well as of monetary policy decisions, reflecting in real time the information that becomes available to the markets every day. However, it should be emphasised that on the day of the announcement, we can expect the markets to react only to the unexpected component, or "news" or "surprise", of an announcement. The remaining component of the announcement has been incorporated into the market previously, but since we cannot determine the exact timing of when this occurred, we cannot measure its impact on the markets to the same degree of accuracy.

$$Sk,t = \frac{Ak,t - Ek,t}{\Omega k}$$

Our measure of news is therefore the surprise component ***(Sk,t)*** of the announcement ***k***, which is defined as the difference between the actual announcement ***(Ak,t)*** and the market's prior expectation ***(Ek,t)***, normalised by dividing by the sample standard deviation ***Ωk*** of each announcement in order to allow a comparison of the relative size of the coefficients in the econometric model:

DATA

As mentioned above, we treat the currency market value as an indicator of state for a country's economy and try to understand the lek exchange rate against the two hard currencies, US dollar and euro, focusing our real-time data research on the main macroeconomic announcements in the three focus economies primarily important to determine the rates.

Regarding the variables and related macroeconomic announcements, literature offers a broad set of them that can be used to explain/predict foreign exchange movements making it hard to determine them, especially during the financial crisis period; but, our selection is based taking into reference the typically used ones in several studies and specific indicators important in defining the crisis of financial markets. Our analysis attempts to comprise data from the real economy, prices, leading indicators and policy variables. Thus, because of the unusual period of external shocks, we decided to include some measures of foreign financial tensions and risk aversion that are often used in the recent literature on asset prices. It is noted that market participants anticipated with their positioning the ECB policy rate well (only 4 surprises). FED funds rate, too, has been close to zero since December 2008. FED has thereafter used other monetary policy instruments to affect the cost of borrowing toward the desired levels. Due to unavailability of money growth expectations, we add 3-month T-bills rate as a proxy of FED policy intentions. In the Albanian economy, expectations about BoA's policy rate were deemed confusing and uninformative, thus we rely solely on the M3 indicator. Also, fiscal news was not possible to construct; instead, we use the spread between 12-months T-bills and 1-week repo rate and the spread of the 10-years bonds of Italy, Greece and Spain from their German counterpart. We include also CBOE Market Volatility index (VIX) and the Australian dollar - Swiss franc exchange rate. Meanwhile, yields' spreads and VIX Index aim at capturing vulnerabilities to the US and Euro area crises, the last variable proxies investors' risk aversion, or external exposure, where the Swiss Franc acted as a "safe haven" currency in carrying trade transactions (den-stop hypothesis). In order to reflect the big and important economic weight of the German economy in Eurozone, we include IFO Business Climate Index as well.

We use the daily US dollar – euro / lek rate in the end of the day, at 14.30, which implies that European and Albanian news are reflected in the exchange rate on the same day, while the US news in the following day. Albanian data releases are sourced from INSTAT and Bank of Albania, while expectations of these releases come from IMF Country Reports and World Economic Outlook

database. On the other hand, Eurozone and US data were collected mainly from Bloomberg, as well as from ECB, Reuters, Eurostat, IFO Institute, Bureau of Labor Statistics, Bureau of Economic Analyses and the Federal Reserve. Our data set includes about 66 news items for most of the variables, given the time period from January 2007 to July 2012 and the fact that announcements for most of variables occur on a monthly frequency.

A brief description of Albania, US and Euro area macroeconomic announcements selected for this study are shown in Table 4.

Table 4. Macroeconomic announcements, release dates and times

Announcement	Period		Nr. of announ.	Nr. of observations
Eurozone				
ECB refirate 2week	Jan-07	5-Jul-12	67	4
Unemployment MoM	Jan-07	31-Jul-12	68	30
HICP, EZ CPI headline YoY	Jan-07	18-Jul-12	67	16
GDP EZ (Q/Q) ann. change	Mar-07	15-Jun-12	22	10
Retail sales EZ (mom)	Jan-07	4-Jul-12	67	60
Industrial Production EZ (mom)	Jan-07	14-Jul-12	67	65
EZ PPI (yoY)	Jan-07	3-Jul-12	67	51
Trade Balance EZ n.s.a	Jan-07	16-Jul-12	67	67
Ifo Business Climate Index	Jan-07	25-Jul-12	67	66
M3 EZ (%) YoY	Jan-07	26-Jul-12	67	65
Announcement	**Period**		**Nr. of announ.**	**Nr. of observations**
USA				
Fed. Funds Target Rate US	Jan-07	20-Jun-12	60	5
Consumer Confidence SA	Jan-07	31-Jul-12	67	67
Housing starts	Jan-07	18-Jul-12	67	65
Trade Balance	Jan-07	11-Jul-12	66	65
Retail sales Monthly % Change	Jan-07	16-Jul-12	67	59
PPI MoM SA	Jan-07	13-Jul-12	67	62
Unemployment Rate	Jan-07	6-Jul-12	67	48
Nonfarm Payrolls MoM Net Change SA	Jan-07	17-Jul-12	67	67
Industrial Production MoM	Jan-07	17-Jul-12	67	60
CPI MoM SA	Jan-07	17-Jul-12	67	46
GDP Q/Q annualised	Jan-07	27-Jul-12	23	15
Announcement	**Period**		**Nr. of announ.**	**Nr. of observations**
Albania				
CPI MoM	Jan-07	6-Jul-12	66	63
GDP Q/Q	Jan-07	9-Jul-12	15	14
Current Account Q/Q	Jan-07	11-Jun-12	23	23
Trade Balance MoM	Jan-07	24-Jul-12	62	62
M3 (%) YoY	Jan-07	30-Jul-12	61	61
Tre. Bills 12m Yield	Jan-07	10-Jul-12	140	

RESULTS

Table 5 displays the sensitivity of Lek/Eur exchange rate

	Coef.		t-Stat.			Coef.		t-Stat.
Eurozone news effects					US news effects			
GDP	-0,1700		-0,50		GDP	-0,1307		-0,63
Industrial production	0,0402		1,58		Industrial production	-0,0075		-0,31
Retail sales	0,0197		0,76		Retail sales	-0,0156		-0,44
Trade balance	0,0557	**	2,21		Trade balance	0,0051		0,07
Unemployment rate	-0,3295		-1,26		Unemployment rate	0,7770		1,49
IFO	0,1096		0,96		Non-farm payroll	-0,0024		-0,04
HICP	-0,0505		-0,10		House starts	0,0207		0,22
PPI	-0,4422		-1,12		Consumer confidence	0,0385		0,41
M3	0,1711		0,62		CPI	0,0336		0,75
REFI	-0,2175		-1,30		PPI	-0,0099		-0,15
					FFR	-0,0914		-0,44
					T-Bill,3M	-0,0049		-1,18
Albanian news effects					Effects of liquidity, sovereign, and credit risk fears			
Balance of Goods	-0,0103		-0,41					
CA balance	-0,0265		-0,71		Spread (AL)	0,0040		0,42
GDP	0,1433	*	1,67		AUD/CHF	0,3123		0,67
M3	-0,0236		-0,89		Spread (EZ)	-0,0045	**	-2,03
CPI	-0,0253	*	-1,81		VIX	0,0003		0,53

*Notes: *, **, *** denotes significance at 90, 95, 99 percent levels*

REACTION TO NEWS ABOUT REAL ECONOMY

Albania's net export of goods and Current Account balance appear to have correct positive sign, meaning that a volume increase would lead to the appreciation of lek; however, good news about domestic GDP are associated with lek depreciation. Eurozone's "good" economic news lead to weakening of the Albanian currency, except for related positive news about Eurozone's GDP that favour the lek or negative ones that would disservice it;

US news effects are mixed: good news about US trade balance, house starts, and consumer confidence are bad news for the Albanian lek; on the other hand, better GDP, industrial production, retail sales, non-farm payrolls, and lower unemployment rate surprises are also perceived as good news for lek's position against the euro.

REACTION TO MONETARY POLICY INDICATORS

Restrictive policies by ECB and FED seem to lend a hand to lek, as they have negative signs. The US 3-months T-bill rate "confirms" the negative relationship, although the coefficient is much smaller. Based on the interest parity theory, one would expect a sudden tightening of ECB policy rate to raise the euro currency value. However, if markets perceive such policy to worsen the real economy and reduce asset prices, such as equities, it might result in a weaker euro (and vice versa).

REACTION TO PRICE SURPRISES

Impact of prices is, again, ambiguous, as it depends on market's perception about central bank's commitment to price stability. If this commitment is perceived as high, policy tightening would cause appreciation; otherwise, as PPP Theory suggests, higher inflation would require nominal depreciation. Higher than expected price developments in Eurozone seem to be good news for the Albanian currency; the opposite is true in the case of the US headline inflation; In addition, bad news for domestic inflation is found to be good news for the national currency. The coefficient is statistically significant and comes in line with findings by Clark and West (2007) that investigate countries with inflation targeting regime that follow the Taylor rule reaction functions.

REACTION TO MEASURES OF FINANCIAL RISK INDICATORS

The overall response of lek/euro exchange rate to risk expectations by market actors is as expected. Higher domestic sovereign spreads look detrimental to the local currency position. Also, lek does not seem much immune at times of capital flight to 'safe havens'. On the other hand, risk fears about the common currency grip Albania's thin foreign exchange market, as euro currency holders manifest reaction by getting rid of it.

CONCLUSIONS

Although most of the estimated coefficients in our analysis had the expected sign, the empirical investigation brought in evidence an overall lack of significant news effects, be they foreign or domestic ones. It might be partly a result of market conditions during the unusual period under consideration, and does not necessarily mean that exchange rate responses are not systematic.
Thus, further testing will be required to check about the importance and significance of domestic vis-a-vis foreign shocks. Testing for asymmetries in the responses to news appear imperative, too, as asset prices are shown to react more strongly to negative than to positive shocks. Similarly, larger shocks are found to cause larger adjustment of exchange rates.

Nevertheless, with a few exceptions, our findings are broadly similar with the size and sign of the parameter estimates in the study for USD-EUR exchange rate responses conducted by Ehrmann and Fratzscher (2004), which suggests that the price discovery process abroad is closely followed by local forex market participants. Finally, digging more into the literature on modelling exchange rates that combines together the news effects, order flows and chartist behaviour may also prove worthy to sort out these issues in the future.

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