

## A decorative banner with a green border. Inside, there is a globe, a large dollar sign, and a line graph showing an upward trend. The background is dark with a grid pattern.



# **Journal of Applied Economics and Business**

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# SPECULATION AND GAMBLING STRATEGIES ON EARNINGS MANAGEMENT: THE CASE OF THE NEW YORK STOCK EXCHANGE ON WALL STREET

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## **Abstract**

*Speculation is the practice in which the speculator is engaged in risky purchase of stock without the intention to maintain it, in an attempt to profit from price movements in the shortest time possible. Wall Street stock market is the largest stock market in the United States of America and the world in terms of turnover and market capitalization. In this paper, we are going to investigate speculation and gambling strategies on earnings management of New York Stock market during the years 2008-2014. The purpose of this paper is to investigate speculation and gambling strategies on earnings management. In this paper, we have investigated earnings management in member companies of the Wall Street stock exchange. This study is carried out using speculation and gambling variables on earnings management. Among the variables, gambling has shown an inverse relationship on earnings management.*

## **Key words:**

*Gambling; Earnings Management; Financial Leverage; New York Stock Exchange.*

## **INTRODUCTION**

Assuming the rational behavior of individuals in economics, it is assumed that all individuals seek to maximize their own wealth, thus shareholders and brokers of stocks are not excluded from this rule. Speculation is the practice in which the speculator is engaged in risky purchase of stock without the intention to maintain it, in an attempt to profit from price movements in the shortest time possible. Based on the degree and type of risk acceptance and intention to purchase stock and what they do for making profit, we can distinguish between objective and non-objective

speculation. Investors in the stock market can be divided into two large groups (Chung-Hua Shen, 2015).

The first category includes investors who make investments after careful examination of companies' financial capability based on reliable information regarding underlying factors such as the company's assets and performance. This type of investment is called rational speculation which contributes to the economic growth of the countries. This category of traders in the stock market are called investors in financial literature (Roser Granero, Salomé Tárrega, 2012).

The second category consists of those who seek quick, easy and effortless profits and make profit through this behavior and sometimes undergo loss. These type of transactions are called irrational speculation and gambling (Luis Coelho, 2010).

Gambling means putting money at risk in the hope of making a profit in a place where there is fortune, luck, and chance and there is no need to take a risk (Roser Granero, Salomé Tárrega, 2012). This paper examines the consequences of pricing in the market clearly motivated by gambling.

When testing the market pricing implications of gambling-driven trading, we find a strong, negative, and statistically significant post-bankruptcy announcement drift of at least 28% over the following year, an important and original result that is clearly inconsistent with conventional market pricing theory. A number of robustness tests indicate that our finding is different from other established phenomena, as well as the level of pre-event financial distress, and industry membership. It is also insensitive to a whole range of different event-study methods (Rasa Kanapickien, 2015).

Kumar (2009) relies on three stock characteristics (price, idiosyncratic volatility and idiosyncratic skewness) to indirectly identify a set of CRSP stocks that seem to conform to his definition of a lottery stock: low priced stocks that, for a small initial investment, offer a very low probability of a huge future reward and a very high probability of a small loss. In parallel ,we work with the specific case of bankrupt firms' stock to provide clear evidence on what happens when investors are able to invest in stocks that have clear lottery-like features. More importantly, our paper also adds to the literature by exploring the aggregate market pricing pattern of stocks exhibiting lottery-like features and by examining the potential role of arbitrageurs in a market dominated by gambling-motivated traders, something not pursued in Kumar's (2009) paper.

Several studies have investigated the effects of earnings management (EM) on investment decision. EM occurs when firms' reported economic performance is altered by insiders to "mislead stakeholders" or "influence contractual outcomes" (Schipper, 1989; Healy & Wahlen, 1999). Overinvestment ensues when actual investments exceed equilibrium investment. Firms that manipulate earnings may



indicate a favorable outcome for investors; such misrepresentations can affect internal decision making and lead to suboptimal or inefficient investment decisions (McNichols & Stubben, 2008). Biddle and Hilary (2006) explained that higher quality accounting and limited EM reduce information asymmetry between managers and outside suppliers of capital, thereby increasing investment efficiency. Fisher and Merton (1984) specified that firms with upward (or downward) EM are expected to invest more (or less) in subsequent periods than does the average firm. Tang (2007) indicated that EM affects subsequent corporate investments by accounting manipulation. Cohen et al., (2009) discovered that firms engaged in either real or accrual EM tend to overinvest. Biddle, Hilary, and Verdi (2009) argued that managers who prioritize their personal welfare are inclined to make investments that are not in the shareholders' best interest. Chen et al., (2011) observed that the quality of financial reporting affects investment efficiency. McNichols & Stubben (2008) investigated whether firms that manipulate reported financial results make suboptimal investment decisions.

The current study observes one caveat, in which the majority of the studies that conduct data analyses likewise study the data distribution first. Therefore, the present study echoes this analysis and further suggests estimating the regression using robust method. However, many of these studies only use one cutoff to avoid possible contradictory results that may be generated when using different cutoffs (Chen et al., 2011; Erkens et al., 2012; Fama & French, 2006; Fan et al., 2007). The findings of these studies may not be robust. Thus, identifying the correct result is unattainable. Numerous studies do not examine the cutoffs. However, in many statistical studies (as described previously and later), using winsorization or simply removing the outliers may generate biased parameters. Therefore, a better, more reliable method is required to suggest the appropriate cutoff. We consider the endogeneity problem because overinvestment may also result in EM.

Kedia and Philippon (2009) argued that overinvested firms are more likely to conduct EM to conceal lower returns within the suboptimal investments. Consequently, we employ the lagged EMs as the regressors to avoid the endogeneity problem. The Heckman two-step method of minimizing the endogeneity problem is also considered.

Lenard and Yu (2012) examined a similar issue using data from China; however, they did not consider the outlier effect. The proxies of their study for EM and investment inefficiency also differ from those in the current study. The EM proxy in Lenard and Yu (2012) is *DAC*, whereas the EM proxies in the current study are both *DREV* and *DAC*. We also consider the three types of fraudulent cases for EM. The



investment inefficiency in their study is also replaced by the adjusted industry median for data gathered from 1997 to 2007, whereas the current study's data were collected from 1998 to 2010. The samples of Lenard and Yu only comprise firms that do not have "Big Four" auditors, whereas the samples of the current study include all firms (except those in the financial services industry). The sample size of their study comprises 3,916 firm-year observations, whereas the present study consists of 14,514 firm-year observations. The OLS results of their study support the EM-overinvestment hypothesis. However, comparing the two studies is difficult because the current study's methods, proxies, sample size, and lengths differ from those of Leonard and Yu.

## RESEARCH METHODOLOGY

In order for the analysis of research data, the extracted documents are studied and then arranged in the general information chart. Then all the data were investigated using Excel and then Eviews7 software. Statistical indicators of central tendency and dispersion were used in the descriptive analysis. Descriptive statistics of variables to describe data include mean, median, maximum, minimum, standard deviation, skewness and kurtosis. Several tests are used in order to evaluate normality and reliability of the research model. Taking into account all classical regression assumptions, combined regression model was used in the inferential analysis to test research hypotheses regarding the econometric model, and t-statistics and Kolmogorov-Smirnov were used to analyze the data. This data is a combination of data related to different companies in different years and are considered as observations of company – year. Fisher statistic model was used to generally investigate the model.

The statistical population of the study consisted of all Wall Street stock companies. Selecting companies listed on the stock exchange as the population is due to further availability and reliability to information, because these companies are listed in the stock exchange after going through steps that must meet admission standards and criteria, and information and audit process etc. is done with better supervision and quality. Also they are the only companies – the shares of which are traded in the pricing stock and are more considered by investors and creditors that attend to the performance criteria of the company. In this study, 123 Wall Street stock exchange companies are investigated over the years 2008 to 2014.

### *The Research Model*

Equation (1) is presented to investigate the probability of gambling:

$$E(BP) = [(1 - \rho)f + \rho(1 - f)](1 + \vartheta) - [(1 - \rho)(1 - f) + \rho f]$$

$$E(BP) = (2 - \vartheta)(f + \rho - 2\rho f) - 1$$





$$[1 - 2f(\rho)] + \frac{(1 - 2\rho)\theta f}{\theta p} = 0$$

P = is the probability of being interested.

F = fraction of total dollars bet on the favorite game

$\theta$  = is the payment commission.

Model 1 is the strategy intended to speculators that the above article addresses.

Model (1): The profitability of companies

$$PROF_{i,t} = B_0 + B_1 PROF_{i,t} + B_2 GROW_{i,t} + B_3 (GROW_{i,t})^2 + B_4 Size_{i,t} + B_5 LEV_{i,t} + LIQ_{i,t} + \epsilon_{i,t}$$

where operating profit (Prof) is net sales revenue minus the cost of goods sold.

Financial leverage (LEV) is obtained by dividing the total debt to assets. We expect that there is a direct and significant relationship between financial leverage and profitability. Considering the advantages of financing through debts (such as lower cost and tax exemption), those companies that use more debt in their capital structure, will enjoy greater profitability.

$$Lev_{i,t} = (Total\ Debt)_{i,t} / (Total\ Asset)_{i,t}$$

Liquidity ratio (LIQ) indicates the liquidity capacity of the company's assets as well as the company's ability in fulfilling its short-term obligations. Companies which maintain desired level of current assets, are less exposed to sudden environmental changes and market risks. in the present article the current ratio is considered as the control variable.

$$LIQ_{it} = (Current)_{i,t} / (Current\ Debt)_{i,t}$$

Due to long-term transaction interruptions or low volume of transactions made on shares, company size is many of the companies surveyed as well as inefficiency of Wall Street stock.

$$Size_{i,t} = Ln(Sale_{i,t})$$

in which the growth of the company is one of the fundamental variables affecting the future status of profitability of the companies and consequently the return on equity investment of companies is fixed in assets that could lay the ground for achieving optimal efficiency in the future. The power of the company may increase

because of higher risk toleration on the company's financial situation as a result of further investment.

$$\text{Firm Growth} = (\text{Total Asset}_{i,t} - \text{Total Asset}_{i,t-1}) / \text{Total Asset}_{i,t}$$

Model (2) revenue achievement

$$\Delta AR_{i,t} = a_0 + a_1 \Delta Rev_{i,t} + \epsilon_{i,t}$$

Where  $i$  and  $t$  imply the  $i$ -th company at time  $t$ , respectively;  $\Delta AR$  investigates annual change in receivable accounts and  $\Delta REV$  represents annual changes in income.

TABLE 1. EXPLANATORY VARIABLES

fixed effects panel data Test				Explanatory variables	
K-S	P – value	t-Statistics	Coefficient		
0.0452	0.1284	1.5511	81.5966	C	Intercept
0.0231	0.0000	4.7863	2.7899	BP	Gambling
0.03256	0.0000	5.7050	4.3133	PROF	profitable
0.04214	0.0000	1.3964	32.8585	<i>Lev</i>	Financial Leverage
0.01325	0.0001	1.9400	31.8782	LIQ	Liquidity ratio
0.03254	0.0000	4.7852	6.9115	Grow	Company growth
0.0214	0.0000	3.7907	2.3092	Size	Company size
21.3267				F - Statistics	
0.0000				P-value	
	0.91			<i>R<sup>2</sup></i>	
	0.85			<i>R<sup>2</sup></i> Modified	
	1.89			Watson	
	Source: author's calculations				

### Research Hypotheses:

*H<sub>1</sub>: Increase in the ratio of debt to capital, makes earnings management positive.*

The ratio of debt to capital is one of the financial ratios as well as financial leverage measuring scales. This ratio is obtained by dividing the total debts of the company by the capital, which shows that what percentage of a company's assets is used to finance its assets. The high ratio of debt to capital could lead to surplus payment of interest which usually means that most of the debt of the company has been used for financing.

If the company use a large amount of debt in its financing and increase the ratio of debt to equity; then the potential company shall make more money compared to the



time when it hasn't made external financing. In this way if the company income significantly increases compared to the cost of debt (interest expense), then shareholders will enjoy more revenue with their previous investment.

*H<sub>2</sub>: Increase in the size of the company, makes earnings management positive.*

The size of the auditing company is one of the most important criteria for auditing criteria, the larger the size is, the greater will be the auditing quality (Nazemi Ardakani), 1 is considered as earnings management and 0 for others in order to calculate the size of the auditing company.

*H<sub>3</sub>: Increase in the gambling, makes earnings management negative.*

Investigating the role of gambling in the stock market is the final hypothesis. A number of shareholders try to increase the number of individual investors through gambling. It is important that conventional financial affairs have become outstanding on the importance of trade (i.e. trade generated by individual investors). There is a growing support for the claim that in pricing securities gambling correction has always a significant effect on earnings management.

TABLE 2. DESCRIPTIVE STATISTICS

strain	skewness	min	max	standard deviation	median	mean	symbol	Variable
0.25	2.23	0.001	0.874	0.954	0.325	0.851	BP	Gambling
0.75	2.14	0	0.1023	0.00136	0.00137	0.0214	PROF	profitable
0.456	1.23	0	1	0.107	0.857	0.816	<i>Lev</i>	Financial Leverage
0.324	1.14	-1.223	6.6685	0.0023	2.9410	0.0214	LIQ	Liquidity ratio
0.1245	2.65	0.04425	2.7062	0.6318	0.833	0.541	Grow	Company growth
0.3256	2.75	9.87955	18.0035	0.055	16.6458	0.0142	Size	Company size

### Testing Hypotheses

1. *First hypothesis*: Increase in the ratio of debt to capital, makes earnings management positive.

The following regression model is used to test the first hypothesis:

#### Results:

considering the fact that the obtained coefficient for profitability is 0.455 in the above

table and the significance level is less than 5%, therefore we can conclude that increase in the ratio of debt to capital, makes earnings management positive (Chung-Hua Shen, 2015).

In this test, B is the slope of the line. Zero value for B indicates insignificance of the model, otherwise it represents the significance of the model.

The level 0.95%, is the confidence level where B is 0.23 which confirms the first hypotheses.

*The second hypothesis:* Increase in the size of the company, makes earnings management positive.

The following regression model is used to test the second hypothesis:

$$SIZE_{it} = \alpha_0 + \beta_1 BP + \beta_2 PROF + \beta_3 LEV + \beta_4 LIQ + \beta_5 GROW + \beta_6 DEPT + e_{it}$$

TABLE 3. TEST RESULTS OF THE FIRST HYPOTHESIS

$SIZE_{it} = \alpha_0 + \beta_1 BP + \beta_2 PROF + \beta_3 LEV + \beta_4 LIQ + \beta_5 GROW + \beta_6 DEPT + e_{it}$					
Index	Results	Level of significance	T-statistic	Coefficients of variables	Variable
1.5698	Meaningful	0.0000	11.4268	3.412	$\alpha_0$
1.898	Meaningful	0.0231	0.759	.2321	BP
1.3256	Meaningful	0.0000	1.3256	1.325	PROF
p-value	Meaningful	test	Amount		
0.0875	0.132	K-S	0.806		R <sup>2</sup>
0.0000	14.125	Fisher test	0.325		R <sup>2</sup> Modified
			1.5698		D-W

### *Test results of the second hypothesis*

Considering the fact that the obtained coefficient for profitability is 0.231 in the above table and the significance level is less than 5%, therefore we can conclude that increase in the size of the company, makes earnings management positive.

In this test, B is the slope of the line. Zero value for B indicates insignificance of the model, otherwise it represents the significance of the model.

The level 0.95%, is the confidence level where B is 0.231 which confirms the second hypotheses.

*The third hypothesis:* Increase in the gambling, makes earnings management negative.

The following regression model is used to test the third hypothesis:

$$BP_{it} = \alpha_0 + \beta_1 SIZE + \beta_2 PROF + \beta_3 LEV + \beta_4 LIQ + \beta_5 GROW + \beta_6 DEPT + e_{it}$$

TABLE 4. TEST RESULTS OF THE SECOND HYPOTHESIS

$BP_{it} = \alpha_0 + \beta_1 SIZE + \beta_2 PROF + \beta_3 LEV + \beta_4 LIQ + \beta_5 GROW + \beta_6 DEPT + eit$					
Index	Results	Level of significance	T-statistic	Coefficients of variables	Variable
1.6589	Meaningful	0.0000	9.2145	2.365	$\alpha_0$
1.8745	Meaningful	0.0235	0.6589	0.3214	BP
1.236	Meaningful	0.0000	1.0325	1.0325	PROF
p-value	Meaningful	test	Amount		
0.0789	0.123	K-S	0.385		$R^2$
0.0000	13.895	Fisher	0.123		$R^2$ Modified
			1.6589		D-W

### Test results of the third hypothesis

Considering the fact that the obtained coefficient for profitability is 0.3214 in the above table and the significance level is less than 5%, therefore we can conclude that increase in the gambling, makes earnings management negative.

In this test, B is the slope of the line. Zero value for B indicates insignificance of the model, otherwise it represents the significance of the model (Roser Granero, Salomé Tárrega, 2012) .The level 0.95%, is the confidence level where B is 0.385 which confirms the third hypotheses.

### Results

It is well known that by adopting methods that reduce the fluctuations of net income, managers often engage in earnings management and gambling. The reason is that managers believe investors pay more money to invest in a company that has a smooth flow of profit. In this study, we have investigated earnings management in member companies of the Wall Street stock exchange. This study is carried out using gambling and earnings management variables (The size of the company, the debt ratio, etc.) Among the variables, gambling has shown an inverse relationship on earnings management.

This method was used to investigate gambling in Wall Street stock exchange, the findings suggest that managers of big companies use accruals in their companies. In case of having debts, companies can also gain benefit which leads to a reduction in the possibility of gambling and speculation on these companies.

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# TOURISM SATELLITE ACCOUNT: MACEDONIA'S CHALLENGE

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## *Abstract*

The paper informs about the importance of designing the Tourism Satellite Accounts (TSAs) as a tool for structural rather than short-term analysis, for quantifying the overall contribution that tourism makes to an economy. Given the fact that Macedonia has identified tourism as one of its priorities for the national economic development, the paper argues the challenges that arise and suggests valuable recommendations for the initial process of the TSA establishment. Besides the identified strengths in the current statistics, some weaknesses also appeared upon a theoretical screening. Consequently, it is strongly recommended that in the following period Macedonia may be focused firstly on developing a 'Pilot Experimental TSA', which may serve as a starting point for further improvements leading to 'Experimental TSA'. Such TSA indicators may be useful for policy-makers since it will provide clear focus on how much tourism contributes to Macedonian economy and how many jobs it creates.

## *Key words:*

*Tourism Satellite Account; National economy; Tourism development.*

## **INTRODUCTION**

Tourism is a significant driver of many countries' economies by contributing not only to national and regional development, but also to cultural development and general well-being. However, it is extremely difficult to measure the overall contribution that tourism makes to the economy. It is not an easy job to track tourism demand and find the number of trips, the use of tourist accommodation facilities and how much tourists spend. The way-out is detected in the harmonised system of Tourism Satellite Accounts (TSAs) developed over the years by the World Tourism Organization (UNWTO), the United Nations Statistics Division (UNSD), the Organization for Economic Cooperation and Development (OECD) and the Statistical Office of the European Union (Eurostat).

The TSA concept fully conforms to the national accounts definitions and classifications and serves as internationally recognized framework for measuring tourist activity and



the importance of tourism to national economy. Opposite to traditional tourism statistics which is focused on 'flows' (number of tourists, overnights, etc.), the TSAs presents how much tourism contributes to an economy and how many jobs it creates.

Many countries were encouraged to introduce the TSAs, but so far only 22 submitted the indicators thus enabling analysis of tourism in macroeconomic frames (Eurostat, 2013). Even than some TSA indicators were incomplete or sparsely covered, so the UNWTO recommended framework (UNWTO, 2008a and 2008b) has been only partially followed.

The literature contains a large body of work arguing the necessity of developing TSAs (Dwyer et al, 2007; Frechtling, 1999; Jones & Munday, 2008; Libreros et al, 2006; Smeral, 2006; Smith, 2004). This paper adds to the current research on the TSA importance, by elaborating the challenges Macedonia is facing with in the initial process of the TSA establishment. This is generally done by identifying strengths and weaknesses in the current statistics, along with posing valuable recommendations that Macedonia may be focused on in the following period. The novelty of this paper is that represents a pioneer work for a TSA in Macedonia since no previous study paid attention.

### *TSA concept development*

The purposes of TSAs are threefold: (i) To analyse in detail all aspects of demand for goods and services associated with the activity of visitors; (ii) To observe the operational interface with the supply of such goods and services within the economy; and (iii) To describe how this supply interacts with other economic activities.

As a popular method of measuring the direct contribution of tourism consumption to a national economy, it has a long evolutionary route whereas it converts tourist 'spend' into 'value added' (Fig. 1). The TSA does not state which markets to target, what type of hotels to invest in, or what part of the tourist product needs to be improved.

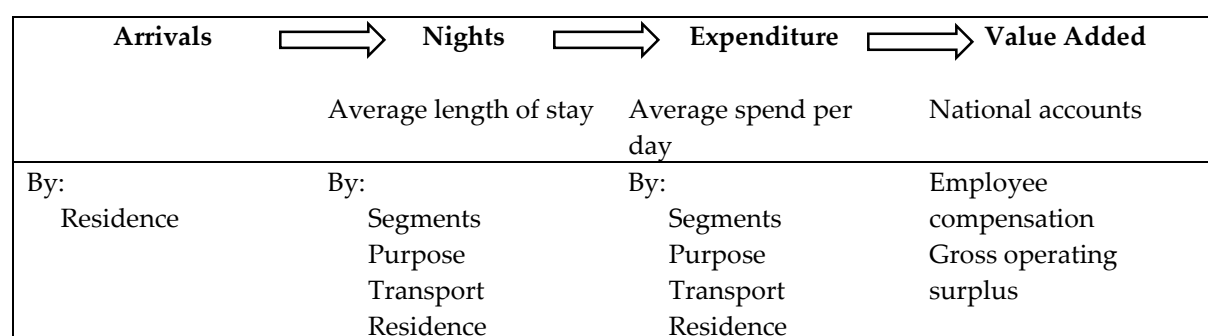


FIGURE 1. THE ROUTE FOR THE TSA

### *The 'Usual Environment' concept*

The purpose of introducing the concept of 'usual environment' is to exclude from visitors those travelers commuting regularly between their place of usual residence and place of work or study, or frequently visiting places within their current life routine, for instance homes of friends or relatives, shopping centers, religious, health-care or any other facilities that might be at a substantial distance away, or in a different administrative area but are regularly and frequently visited. Based on the prevalent habits of movements, it is recommended that each country define the precise meaning of what is termed regular and frequent in the context of its tourism statistics. Trips to vacation homes are usually tourism trips. Recognizing the growing importance of these trips in an increasing number of countries, and because of the specificities of the corresponding expenditure and activities, tourism statistics compilers are encouraged to measure them separately for analytical purposes and cross-country comparisons.

Because the measurement of flows of visitors and of all associated variables is highly sensitive to the definition of the 'usual environment', it is recommended that neighboring countries or countries belonging to supranational organizations consult with each other in order to ensure compilation of comparable statistics. There are often differences in density of population, transportation accessibility, cultural behaviors, proximity to national or administrative borders, etc., between countries. These differences hinder the development of a unique worldwide statistical determination of the usual environment of an individual. Nevertheless, the determination of the usual environment should be based on the following criteria:

- Frequency of the trip (except for visits to vacation homes);
- Duration of the trip;
- The crossing of administrative or national borders;
- Distance from the place of usual residence.

### **ORGANISATIONAL STRUCTURE FOR THE TSA**

The right organizational structure for the TSA is essential because of the wide range of data and expertise that is required. It obligates cooperation between different institutions in particular the Ministry in charge for tourism development, the State Statistical Office (SSO), the National Bank, the Ministry of Finance, the Ministry of Interior etc. Three tier organisational structure works well in the experience of UNWTO, comprised of:

- an overall Steering Group;
- a core TSA team; and
- several technical committees dealing with specific issues.

Each institution involved has its own role in the TSA. In this line, tourism working with the SSO is concerned with providing the tourism statistics, in effect the demand statistics. The SSO National Accounts is concerned with the production accounts, in



effect the supply side, which is then concerned with the reconciliation of demand and supply, and with producing the key metrics of tourism direct gross value added and gross domestic product.

## CONCLUSIONS AND RECOMMENDATIONS

The paper presents some stylized facts on number of practical and conceptual challenges associated with the TSAs. The general conclusion is that Macedonia is facing a great challenge in the initial process of the TSA establishment. Some strengths are identified in the current statistics mostly referring to the strong statistical competence of the SSO. It is also noticeable the growing tourism industry, particularly the private sector, which implies more statistics and a TSA.

However, based on theoretical screening, some weaknesses also appeared in the statistics. Namely, there are substantial gaps which must be envisaged in the first line dealing with the coverage of tourism visitors (e.g. visitors not using registered accommodation etc.), and too long periodicity of key sample surveys (which must shorten from five to two years). So, there are many open issues on accommodation statistics, hence referring capacity and utilization. Namely, the SSO undertakes surveys on covering the following accommodation units: hotels, boarding houses, motels, overnight lodging houses, spas, mountain lodges and houses, workers' vacation facilities, children and youth vacation facilities, youth hotels, temporary lodging facilities (student dorms), sleeping cars and uncategorized accommodation establishments. However, the houses, vacation apartments and rooms for rent, are not covered by this kind of surveys.

Therefore, the paper strongly recommends that in the following period Macedonia may be focused firstly on developing a 'Pilot Experimental TSA', which may serve as a starting point for further improvements leading to 'Experimental TSA'. Yet, in order to come to this end objective, numerous background activities must be programmed, like:

- Carrying out necessary sample surveys;
- Organizing focus groups;
- Undertaking investigations as ad hoc studies;
- Preparing needed sample surveys for the forthcoming years noted as reference ones;
- Ensuring follow up process etc.

So, in the first 3-4 years, Macedonia may create the piloting TSA which may include tables 1-7 and 10, while the Tables 8 and 9 may be left out. More precisely, the following table improvements may be recommended:

- *Table 1* (referring to inbound tourism expenditure) may be extended to give full coverage by including:
  - Casino visitors (staying less than 24 hours, same-day); Transit visitors (staying less than 24 hours);
  - Visitors using informal commercial accommodation; and
  - Visitors staying with friends and relatives.

At the same time, the next round of visitor sample surveys may be prepared thus covering the overnighter and the same-day visitors, but this time by providing data for private tourism sector as well. This means that the necessary ad hoc sample surveys must be prepared by including sample surveys as required for the transit visitors, casino visitors, VFR visitors, and visitors using informal accommodation. Furthermore, some sample surveys or focus groups with tour operators may be organized in order to ascertain what money comes into the Macedonian economy. So, it can be generalized that it is perfectly possible for Macedonia to get the statistics for Table 1 of the TSA including a breakdown of expenditure both, by the tourist directly and by the spending on his/ her behalf by tour operators;

- *Table 2* (referring to domestic tourism expenditure) may be more focused on clarifying the term 'usual environment', which is always an issue. The key moment is ensuring that the sample is representative (or can be made representative) of the 'universe/population' being estimated. Grossing up when there are large differences in travel propensity according to geographic location can be difficult. This way it may be manageable to keep using whatever data is possible in a tourism module in a household surveys on expenditure or trips;
- *Table 3* (referring to outbound tourism expenditure) as a temporary measure, may have information on the immigration on departing residents, so at least will include data on outbound visits. Furthermore, it may include the travel debits and passenger transport debits as reported by the NBRM to the IMF;
- *Table 4* (referring to internal tourism consumption) may leave out 'Other consumption' unless vacation homes are of real significance. In this line, the 'Other consumption' covers:
  - Vacation homes - where this does not involve renting out the vacation home;
  - Trips provided by institutions to individuals e.g. factory holidays, trade union holidays etc.; and
  - Services provided to visitors for which they do not pay (e.g. museums);



- *Tables 5 and 6* (referring to the value added) may ascertain what can be described as tourism characteristic industries and hence, will have available the output, intermediate consumption and value added;
- *Table 7* (referring to employment) may use the data from the Labour Force Survey in the line of putting together only the estimation of employment in the tourism industries. It is important to include this table because of the frequent strategic importance of tourism in the development of an employment policy;
- *Tables 8* (referring to tourism gross fixed capital formation) and *Table 9* (referring to tourism collective consumption) may be left out since are accorded a lower priority. Yet, their inclusion in the TSA might be considered in a future stage;
- *Table 10* (referring to non-monetary indicators) may be completed to the extent possible. This table presents indicators which are required to assist the estimation and support the interpretation of the information presented in tables 1-7.

Additional recommendations may be taken into account as a possible way forward for tourism demand statistics.

- Regarding the *inbound international tourism data*, the following issues of coverage may be addressed: Same-day visitors to casinos; Transit visitors; Visitors not staying in registered accommodation; and Visitors staying with friends and relatives. Furthermore, the sample surveys may have larger coverage and more frequent periodicity. They may be undertaken at the border post, in accommodation facilities, or conclusions may arise from focus groups of tour operators;
- Regarding the *domestic tourism data*, the sampling surveys may be undertaken at household level, particularly when addressing the overnight visits as well as the same-day visits; and
- As far as the *outbound tourism data*, it must be clarified what is the domestic component of the expenditure on an outbound trips.

Finally, it needs to be born in mind that collecting data for the TSA is a complex process and requires joint effort of all involved parties in pooling the knowledge and experience. It is not enough to have the will to do it, but also requires adequate statistical infrastructure in place to support TSA development, along with having the financial support and expertise to develop the infrastructure.

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# INTEGRATION AND CONTAGION OF BRIC FINANCIAL MARKETS

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## Abstract

*We add to the debate promoted by Misra and Mahakud (2009) and Chittedi (2010) aiming to measure the levels of financial integration and contagion of BRIC. We follow Vahid and Engle (1993) and Johansen et al (2000) in order to extract individual and common trends and cycles of BRIC major stock market indices. Our evidence in the short-run suggests a contagion effect with Brazilian and Chinese financial markets playing a leading role, which can be useful to worldwide investors that should consider reactions in these markets during crisis as a predictor of other BRIC reactions through the contagion channel. In the long-run we are able to identify three common scenarios: one of them reflecting a possible converging trajectory for BRIC financial markets, and the other ones following negative risk drivers still incorporating the effects of the recent crisis, without recovery of these markets. This finding suggests that BRIC financial markets are linked, even in an environment without the desirable level of harmonization of respective stock markets with the international rules and regulations.*

## Key words:

*BRIC Stock Market Indices; Common Trends; Common Cycles.*

## INTRODUCTION

Since the pioneering customs unions in the nineteenth century, the society has observed an ongoing process characterized by the formation of various types of blocs based on the mutual benefit and efficiency gain in terms of commercial or monetary transactions for the economies involved.<sup>1</sup> However, more recently we can observe a different phenomenon. There seems to be a favorable scenario for the imagination of financial market, which creates at random acronyms that sound good to the ear, attracting the attention of academics, practitioners and policy makers in the direction of some selected economies. In this context, Goldman Sachs first used

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<sup>1</sup>One can see Warwick (1994) on the impacts of North American Free Trade Agreement (NAFTA), Bergsten (1997) on Asia-Pacific Economic Cooperation (APEC), Flores (1997) on Southern Common Market (MERCOSUR), while Winters (1993, 1994) and Bayoumi and Eichengreen (1997) are good references on the impacts of commercial arrangements in Europe.

in 2001 the term BRIC, referring to a subset of emerging economies – Brazil, Russia, India and China – that should play a leading role in the global economy. From this creation, many other suggestions of grouping of countries emerged.<sup>2</sup>

As extensive as the imagination of financial market is the related literature. However, why should we care about foundationless acronyms creation? Probably, because the economies composing these “ex ante” fake blocs are taking this opportunity as an incentive to form real economic blocs, sending an image that they are homogeneous or complementary and also share common features. Here, we enter this vast debate by analyzing how appropriate in financial terms is the use of one of these acronyms, BRIC, supported by the evidence of how financially integrated is this bloc and how strong is the financial contagion across Brazil, Russia, India and China.

More specifically, we aim to analyze if BRIC main stock indices share an equilibrium relationship so that they cannot move independently in the long- and short-run, during the period from January 1998 to November 2010. In this context, we are conceptually aligned with Bai (2008, 2009), Misra & Mahakud (2009), Verbus & Sportel (2012), and Çakir & Kabundi (2013). Methodologically, we follow Vahid & Engle (1993), and Johansen et al., (2000) in order to address this issue in the sense of D'Ecclesia & Costantini (2006), Matos et al., (2014a) and Matos et al., (2014b). Given our purpose, this paper parallels the work of Chittedi (2010).

It is not easy to draw parallels between our evidences and previous findings because most of studies about stock market integration use to analyze it within developed markets instead of emerging ones. Though, the literature specifically about this issue involving BRIC seems to be scarce. Anyway, observing some previous related studies, all of them evidence long-run relationship, but they are not consensual about the influence in the short-run.

Our results of the individual decomposition suggest that short-run reactions during Russian and Brazilian crisis are comparable to the deviations occurred during the global crisis. We also find that Brazilian and Chinese financial markets exert relatively higher influence in the short run. This is useful to investors as a signal regarding their power to forecast other BRIC reactions through the cycle transmission channel. In the long-run, the identification of three common scenarios has implications for policy makers, providing them fundamentals to adopt more

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<sup>2</sup>In 2008, Financial Times proposed the pejorative term PIIGS for some European countries with high levels of debt and public deficit. In 2010, Passport Capital attracted the eyes of the world for the CASSH, an acronym that stands for five developed countries: Canada, Australia, Singapore, Switzerland and Honk Kong. In 2011, a new set of up-and-coming emerging markets was gaining attention as hot markets with fast-growing populations, relatively stable political environments and the potential to produce outsized returns in the future: the CIVETS, as a reference for Colombia, Indonesia, Vietnam, Egypt, Turkey and South Africa. In an online post highlighting the top 10 risks of 2013, Eurasia Group warns of the perils of Japan, Israel and Britain, the JIB.



appropriate stock market regulations, as well as motivating a discussion about a globalization intra-bloc in terms of alliances of the respective stock market exchanges.

The relevance of our findings are due first to the size of this bloc, which occupies 26% of the world's land coverage, where 45% of the world's population live in. Moreover, these economies used to share 14.2% of total trade in the world market in 2008, according to Organisation for Economic Co-operation and Development (OECD) and BRIC Gross Domestic Product (GDP) in 2010 US\$ on Purchasing Power Parity basis was about 24.9% of world GDP, according to International Monetary Fund (IMF).

Second, BRIC is very heterogeneous. This bloc is formed by a market economy with a high level of inequality, poverty, democracy and urbanization, an ex-socialist superpower with high per capita income and human capital levels, a predominantly rural country with strong cultural and religious divergences and a communist dictatorship with a high degree of trade openness and high level of international reserves.

Observing specifically the respective stock markets, the divergences remain. In 2010, the Chinese market capitalization of US\$ 5.7 trillion was more than four times the Russian amount. The difference regarding the number of domestic companies listed is notably: India with more than 5,000, while Brazil has less than 500.

Third, we know that a higher level of contagion in partner economies can promote a process of strengthening the domestic markets involved, which is essential for the domestic corporate environment and contributes to capital accumulation and technological innovation: key elements for economic growth. The literature points the information asymmetry as a relevant element in the transition mechanism of contagion between emerging markets.

However, BRIC are not located in the same geographic region, they do not share many similarities in terms of market structure nor history, and the direct linkages through trade and finance are not so strong yet: the amount of US\$ 320 billion in 2011 of intra-BRICS trade was a small fraction of their trade, less than 5%, according to data from the International Trade Center. In financial terms, when we observe the foreign direct investment (FDI) amount, inflows to BRIC come mainly from outside the bloc, which is also true for outflows of FDI from BRIC, according to Mathur & Dasgupta (2013).<sup>3</sup>

To summarize, according to the following quote from Goldman Sachs (2001)'s report: "Clearly, the four countries under consideration are very different

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<sup>3</sup> See Holtbrügge and Kreppel (2012) for a recent study about foreign direct investment issue in BRIC.

economically, socially and politically, [...]". As can be seen in this complex scenario, it is not obvious to infer about common long-term trajectories associated with economic fundamentals or about how these markets will react to global or local shocks in the short-run.

This article is structured into five sections including this introduction. Section 2 gives an account of the empirical literature about financial integration and contagion, before explaining the methodology in the third section. We present the results in the fourth section and the final considerations are in the fifth.

## **LITERATURE REVIEW**

Quinn (1997), Kose et al., (2006), and Henry (2007) are relevant sources of discussion about concepts and measures of integration. Among other approaches, we mention a well succeed researching route developed by Taylor & Tonks (1989), Kasa (1992), and Masih & Masih (2001) that follows Engle & Granger (1987), and Johansen (2000), based on the existence of cointegrating vectors formalizing a long-term relationship as useful to infer about integration of samples of economies.

This cointegration framework is useful to distinguish between the nature of long-run and of short-run linkages among financial markets and also captures the interaction between them. This methodology seems to be more appropriate also because it allows us to infer about long-run and short-run relationships under the same set of assumptions, very mild by the way if compared to other ones.<sup>4</sup> Thus, this technique has been widely used in macroeconomic studies to analyze the transmission of business cycles between countries, or even between sectors of the economy, as in Engle & Issler (1995). However, for financial purposes, there is not a vast application.

From the methodological perspective, if there are comovements, it is possible to synthesize complex systems into a simpler structure of common components. Therefore, following Granger & Weiss (1983), Engle & Granger (1987), Stock & Watson (1988), and Engle (1997), we are also able to analyze other common characteristics in the sense of Engle & Kozicki (1993). Among these characteristics, the presence of common cycles is useful to infer about contagion between financial markets, an issue explored conceptually in Claessens & Forbes (2004). According to them, the financial crises of the late 1990s prompted extensive empirical research on contagion, as in Chan-Lau et al., (2004), and Majid & Kassim (2009).

Here, we extract individual and common cycles, following Vahid & Engle (1993), and then, we employ Granger Causality with the aim of inferring about the influence

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<sup>4</sup>Convergence exercises of financial indicators are also useful to study integration, although most techniques are not robust to structural breaks. Following this approach, Antzoulatos et al. (2011) and Matos et al. (2011) apply the Phillips and Sul (2007) method to financial and economic indices worldwide, while Furstenberg and Jeon (1989), Bianco et al. (1997) and Schmidt et al. (2001) limit the sample to developed countries.



of temporary deviations of the trajectory of each financial market on other markets.<sup>5</sup> We are able to analyze comovements in BRIC stock indices, which enables us to test for contagion controlling for the role of economic fundamentals – captured by trends –, a common source of omitted variables. Although the volatilities are higher during the periods of crisis, we do not have heteroskedastic cycles.

Finally, we can deal with endogeneity by employing VAR specification to model stock market returns, which also helps to account for serial autocorrelation in returns (Pick, 2007; Forbes & Rigobon, 2002).

In studies methodologically similar to our paper, such as Hecq et al., (2000), Morley & Pentecost (2000), Sharma & Wongbangpo (2002), and Westermann (2002), the results of long- and short-term comovements between financial indices are also used to analyze market efficiency, market equilibrium, price equalization, portfolio diversification or even to make inferences on which financial markets are more influential than others in specific groups of countries. In turn, D'Ecclesia & Costantini (2006) discuss aspects related to international diversification associated with a portfolio composed of the indices analyzed, finding evidence of a single common cycle and low explanatory power of diversification in the short run.

Regarding specific studies that limit the analysis to samples containing BRIC stock markets, Bai (2008) analyzes this bloc's financial integration based on a multivariate VAR and impulse-response function applied to daily series of returns on BRIC stock markets indices, besides Mexico and some developed economies, during a time span from 1994 to 2006. This study evidences a partial integration level, which increases by fixed exchange regimes and during the crisis period. A stronger result is reported in Bai (2009), who evidences that the BRIC financial markets, the foreign exchange and equity markets are fully integrated with the world market and among themselves, with Brazil exerting the highest level of integration, followed by Russia, India and China.

Chittedi (2010) employs a cointegration approach, but over a more recent period – daily data from 1998 to 2008. The main conclusions suggest that BRIC share a long run equilibrium, with a contagion transmission characterized only by the influence of Indian financial market on Brazilian and Russian ones.

In Verbus & Sportel (2012), the aim is to measure the effect of the contagion caused by the US debt crisis. The authors conclude that it is not the strength of the linkages that matters the most, but more the stability and prudence of country's banking sector, which it is observed in Brazil. In less integrated countries, as China, Russia and India, short-term measures seem to work better than the long term measures.

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<sup>5</sup>Another test of common cycles is described in Carvalho et al. (2007).

Addint to this discussion, we aim to evidence if the null hypothesis of financial integration and contagion holds, based on empirical exercises that use broad national indices as proxy for BRIC stock markets. Among others, as the sample of stock indices or the period analyzed, one main difference of our procedure is that we apply a methodology robust to structural break to BRIC stock indices. More specifically, first, we test here if cumulative returns on the main BRIC stock indices cointegrate, i.e., if there are common stochastic trends implying a relationship of long-term equilibrium between them. The null hypothesis of financial integration depends on the real economic linkages between BRIC, which are clearly different.<sup>6</sup>

Objectively speaking, our second null hypothesis attempts to the presence of financial contagion in BRIC. Theoretically, financial markets in emerging market countries with strong economic linkages appear to be more vulnerable to contagion, mainly if there are financial crisis that can act as a common shock to these countries. The information asymmetry can also be relevant as transition mechanism of contagion between emerging markets.

## **METHODOLOGY**

### *Stationarity and structural break*

Series of returns on assets are usually stationary, but the same does not hold when we observe series of cumulative gains, which carry some of the statistical properties of the series of asset prices. Here, we use cumulative gain of a local investor in his own main stock market index, which may oscillate around a trend, deterministic or stochastic. This suggests us to perform stationarity tests as the first methodological stage.

Each test seems to be more appropriate due to the power of the test, the presence of serial autocorrelation or heteroskedasticity of residuals, and the size of sample. So, we perform four usual unit root tests:

- i) The augmented version (ADF) of the test originally proposed in the Dickey & Fuller (1979, 1981);
- ii) The semi-parametric framework suggested in Perron & Phillips (1988);
- iii) The method developed by Elliot et al., (1996); and
- iv) The technique proposed in Perron & Ng (1996).

We show these results in Table 3, Panel A. However, when we are dealing with series that can be decomposed in two stationary subsamples separated by a structural break, these tests seem to be biased to infer the presence of trend. In our case, specifically during the financial crisis that started in 2007 with greater repercussions in 2008, there is a sharp drop in the series of cumulative returns,

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<sup>6</sup> See Bhar and Nikolova (2009).



suggesting the presence of a structural break. We consider this issue, incorporating the possibility of structural breaks in the stationarity tests, whose results are reported at panels B and C.

Following Evans (1989), Perron & Vogelsang (1991), Banerjee et al., (1992), Christiano (1992), Zivot & Andrews (1992), and Leybourne et al., (1998), we can assume that the breaks are associated with the extreme values of the asset return, so we should model them endogenously. There is also a second approach aligned with Perron (1989, 1990), Park & Sung (1994), Lütkepohl et al., (2001) and Saikkonen & Lütkepohl (2001, 2002), which analyzes this issue under the assumption of exogenous choice of the break points, according to some statistical criterion for identifying the date of break or due to an event considered as an exogenous relevant shock.

Therefore, as our main stationarity test, we perform follow Saikkonen & Lütkepohl (2002). First, we consider the break endogenously. Second, we identify it through the Chow test, according to Candelon & Lutkepohl (2001) and we use it exogenously. In all specifications, we include a constant and a trend. As a robustness check, we also perform them without the trend. Here, we do not report this latter result, although we discuss about it.

### *Cointegration, trends and cycles*

Engle & Kozicki (1993) add to time series literature with a formal concept of common feature of the series of the system. Even though each of the series individually has the feature, there is at least one nonzero linear combination of these series that fails to have this feature. The feature is usually a data property such as serial correlation, seasonality, autoregressive conditional heteroskedasticity or kurtosis.

In order to study the level of financial integration based on this common feature approach, i.e., if their individual components are connected so they cannot move independently of one another in the long run, we may observe if our non-stationary series have the same order of integration and if they are cointegrated.

Aiming to evidence if the cumulative returns on BRIC main indices share a common stochastic trend, we need to identify the cointegrating vectors. Since we have  $N = 4$  series in our system, there may be at most  $r = 3 = N - 1$  linearly independent cointegrating vectors, which may be arranged in matrix given by  $\alpha_{(N \times r)}$ , whose range is said the cointegration space. Among the methodologies of cointegration in a multivariate context, here we follow Johansen et al. (2000), which controls the effect of lagged variables, in addition to be robust to the insertion of an exogenous structural break.



Regarding the contagion effect, we follow methodologically Vahid & Engle (1993). According to them, an implication of the evidence of the serial correlation in the series in first difference as a common feature is the existence of common cycle in the series (in level). In our case, there can be at most  $s = 3 = N - 1$  linearly independent cocharacteristic vectors, which can be arranged in matrix given by  $\tilde{\alpha}_{(N \times s)}$ , whose range is said cocharacteristic space.

### *The framework*

It is useful to represent non-stationary time series as consisting of three parts: a trend, a stationary component and a noise, which allows us to measure whether the stationary term smoothies or extends the long run deviations, besides identifying if the series are trend-stationary or whether they have a stochastic trend. According to Beveridge and Nelson (1981), we can decompose linearly the nominal cumulative return on each stock market index  $i$  in terms of the local investor's currency,  $R_t^i$ ,  $t = 0, 1, 2, \dots, T$  as a sum of  $P_t^i$  and  $C_t^i$ .<sup>7</sup> In this decomposition,  $P_t^i$  is a permanent component, as a random walk with drift, whose intuition is related to long run forecasting of the trend adjusted series. The second term,  $C_t^i$ , is a stationary term, called transitory or cyclic, which consists of a linear combination of current and lagged residuals able to capture the short run effects of the respective stock market index. We can rewrite this decomposition as

$$R_t^i = P_t^i + C_t^i = P_{t-1}^i + \delta^i + \psi^i(1)\varepsilon_t^i + \psi^{*i}(L)\varepsilon_t^i \quad (1)$$

In this first relation, the terms that compose  $P_t^i$  are:  $\delta^i$ , the trend's drift,  $\psi^i(1)$ , which represents the sum of parameters of lag operator  $L$  of asset  $i$  and  $\varepsilon_t^i$ , the residual of asset  $i$  at time  $t$ . The cyclic component is composed by  $\psi^{*i}(L)$ , a specific adaptation of  $\psi^i(L)$ , applied to residuals.

However, our purpose here is not analyzing an individual financial market, but a system of series of cumulative returns on main BRIC stock indices. In this case, it is usual to follow Stock and Watson (1988) who propose a matrix version of Beveridge and Nelson (1981) decomposition. So, we can revisit the relation (1), writing the following system:

$$\Delta R_t = \delta + \psi(1)\sum_{j=1}^t \varepsilon_j + \psi^*(L)\varepsilon_t \quad (2)$$

Here,  $\Delta R_t$  denotes an  $N \times 1$  vector of cumulative returns in first difference,  $\delta$  is an  $N \times 1$  vector of drifts,  $\varepsilon_j$  represents an  $N \times 1$  vector of residuals at time  $j$  and  $\psi(L)$  is a matrix polynomial in the lag operator  $L$  that can be decomposed linearly as the sum  $\psi(1) + (1 - L)\psi^*(L)$ . Based on this decomposition, regarding the long run relationship, if  $\psi(1)$  has not full rank, there will be  $r = N - k$  cointegrant vectors,

<sup>7</sup>There are several ways to decompose non-stationary series components in stationary and non-stationary components. However, the decomposition of Beveridge and Nelson (1981) draws particular attention to empirical studies of income, since the tendency as a random walk can be related to the concept of permanent income.



where  $k$  is the rank of  $\psi(1)$ . We can relate the common features in the short and long run, so that if there are  $r$  cointegrating vectors, and if  $\psi^*(L)$  has not full rank, then there can be at most  $s \leq N - r$  linearly independent cocharacteristic vectors.

These vectors can be identified, since columns of  $\alpha_{(N \times r)}$  e  $\tilde{\alpha}_{(N \times s)}$  are the eigenvectors corresponding to zero and unit eigenvalues of  $\psi(1)'$ .<sup>8</sup> This procedure of identifying these vectors is based on the prior maximum likelihood estimation of the Vector Error Correction Model (VECM).

Finally, when there exist exactly  $r$  linear independent cointegrating vectors and  $s = N - r$  linearly independent cofeature vectors, Vahid and Engle (1993) proofs that we can recover the trend and the cycle part of each BRIC return series.<sup>9</sup> In this case, matrix  $A_{(N \times N)} = \begin{bmatrix} \tilde{\alpha}' \\ \alpha \end{bmatrix}$  has full rank. Partition the columns of its inverse accordingly as  $A^{-1} = [\tilde{\alpha}^- | \alpha^-]$  and recover the individual trend and cycle decomposition as:

$$R_t = P_t + C_t = \tilde{\alpha}^- \tilde{\alpha}' R_t + \alpha^- \alpha R_t \quad (3)$$

The permanent component of each stock market depends on cofeature vectors only, while the cyclic component depends on cointegrating combinations.

## EMPIRICAL EXERCISE

### *Dataset and descriptive statistics*

The main indices by trading volume and scope of composition of BRIC stock markets are the following:

- i) IBOVESPA (São Paulo Stock Exchange Index, Brazil),
- ii) SSE (Shanghai Stock Exchange Composite Index, China),
- iii) SENSEX-30 (Bombay Stock Exchange Index, India) and
- iv) RTS (Russian Trading System Index of Moscow, Russia).

Although in 2011 South Africa was included as a member, our analysis will be limited to the original formation.<sup>10</sup> In terms of time series, our sample consists of 155

<sup>8</sup> In this paper, we follow the Vahid and Engle (1993) procedure, using the routine proposed by Warne (2008).

<sup>9</sup> According to Proietti (1997), it is possible to extract the individual components even if  $s = N - r$  fails to hold.

<sup>10</sup> During the Third Summit of the BRIC Countries, in 2011, South Africa was included as a member, bringing a name change to BRICS, even though this decision was essentially political since economically South Africa is not qualified for membership. According to the publication *BRICS Monitor* of April 25, 2011, South Africa has a GPD of US\$ 350 billion, equal to some 20% of Russia's or India's, the countries with the smallest GPDs in the bloc, and a population of 50 million, only 33% that of Russia, the least populous BRIC country.

observations of net nominal monthly returns during the period from January 1998 to November 2010. Our main data source is CMA Trade.

A visual analysis of the graph of the cumulative returns of the indices in question (Figure 1) may suggest they have common long-term trends until the financial crisis. As of 2007, they start to have heterogeneous patterns, with the start of negative reactions to the crisis at different moments, with more or less accentuated cumulative declines and post-crisis reactions with distinct slopes and intensities.

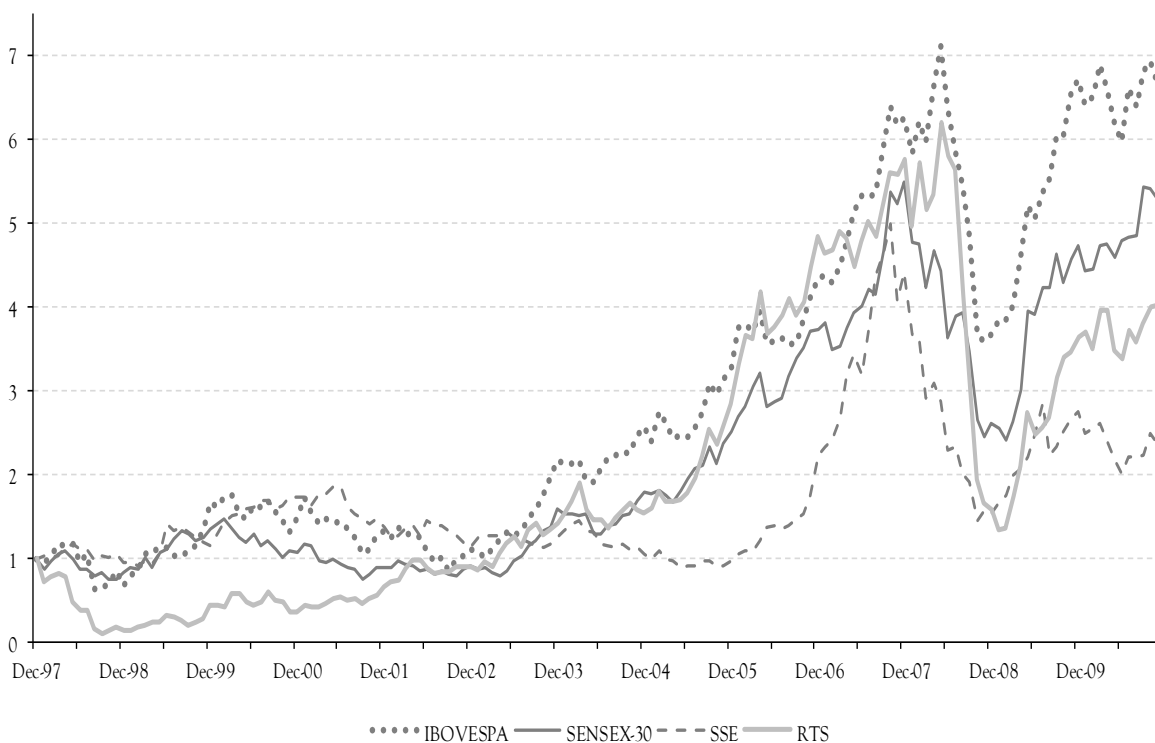


FIGURE 1. EVOLUTION OF THE RETURN ON THE BRIC STOCK MARKET INDICES <sup>a, b</sup>

<sup>a</sup> The figure plots the cumulative return on each stock market index in terms of the local investor's currency, based on the monthly time series for the respective end-of-day quote, during the period from January 1998 to November 2010.

<sup>b</sup> The data source is CMA Trade.

The SSE index has separate behavior during the period from 2004 until the crisis, when it starts reacting before the other three indices, followed by the SENSEX-30. The Russian index shows a cumulative fall of 88.96%, much greater than the 51.62% of the IBOVESPA. After the crisis, the Russian index is also slower to start the recovery, but then does so more vigorously, rising by a monthly average of 5.61% as of January 2009, while the Chinese index's recovery averages 2.33%. Table 1 reports all these descriptive statistics of the indices.



The Brazilian index presents cumulative return of 564.04%, while the SSE only shows a gain of 136.18%. The Russian index presents the greatest absolute values of monthly rise and fall and higher values for all the risk metrics than the other three stock indices. The RTS has semivariance and standard deviation values that are roughly twice the respective ones for the Indian index, the SENSEX-30. Except for the Chinese index, the others are slightly skewed to the left and all show leptokurtosis, with the RTS having the greatest magnitude.

TABLE 1. BRIC STOCK MARKETS INDICES: SUMMARY STATISTICS OF THE RETURNS <sup>a, b</sup>

Statistic/ Stock market index		SSE	IBOVESPA	SENSEX-30	RTS
gain	minimum	-24.632%	-39.554%	-23.890%	-56.158%
	maximum	32.056%	24.046%	31.665%	55.981%
	cumulative	136.176%	564.035%	428.384%	302.497%
risk	standard deviation	8.539%	9.226%	8.001%	14.389%
	semivariance	5.983%	6.920%	5.785%	10.591%
	drawdown	70.968%	51.616%	56.171%	88.961%
other	asymmetry	0.103	-0.667	-0.064	-0.350
moments	kurtosis	4.417	5.044	3.825	5.427

<sup>a</sup> Statistics of the monthly returns on the each stock market index in terms of the local investor's currency, during the period from January 1998 to November 2010. <sup>b</sup> The data source is CMA Trade.

### *Analysis of stationarity and structural break*

According to the usual stationarity tests proposed here (Table 2, Panel A), the series in question seem to be nonstationary, with a single exception: the Chinese index, based on tests proposed in Elliot et al., (1996), and Perron & Ng (1996). Based on these same tests, all four indices are stationary in first difference.

Aiming to deal with the possibility of regime change over time, we implement a statistical Chow test, so we can identify September 2008 as the only break, with instability before this date and stability after. According to the results reported in Panel C, when we incorporate this result in the framework of Saikkonen &

Lütkepohl (2002), or even considering an endogenous structural break (Panel B), we are able to corroborate the previous evidence: the returns on all BRIC stock market indices have a stochastic trend.

TABLE 2. BRIC STOCK MARKET INDICES: STATIONARITY TEST FOR THE CUMULATIVE  
RETURNS <sup>a, b, c, d, e, f</sup>

		IBOVESPA	RTS	SENSEX-30	SSE
Panel A: Traditional unit root tests					
Augmented Dickey-Fuller <sup>b</sup> (H <sub>0</sub> : nonstationary series)	In level	-2.45 [0.35]	-2.84 [0.19]	-1.87 [0.67]	-2.98 [0.14]
	In 1st difference	-10.29** [0.00]	-6.26** [0.00]	-11.62** [0.00]	-6.40** [0.00]
Phillips-Perron (1988) <sup>c</sup> (H <sub>0</sub> : nonstationary series)	In level	-2.45 [0.35]	-2.42 [0.37]	-2.21 [0.48]	-2.56 [0.30]
	In 1st difference	-10.40** [0.00]	-10.20** [0.00]	-11.74** [0.00]	-12.77** [0.00]
Elliott-Lothman-Stock (1996) <sup>d</sup> (H <sub>0</sub> : nonstationary series)	In level	12.47	6.72	18.83	2.78**
	In 1st difference	1.35**	1.85**	1.28**	2.18**
Ng-Perron (1996) <sup>e</sup> (H <sub>0</sub> : nonstationary series)	In level	H <sub>0</sub> : No rejection	H <sub>0</sub> : No rejection	H <sub>0</sub> : No rejection	H <sub>0</sub> : Rejection (1%)
	In 1st difference	H <sub>0</sub> : Rejection (1%)	H <sub>0</sub> : Rejection (1%)	H <sub>0</sub> : Rejection (1%)	H <sub>0</sub> : Rejection (1%)
Panel B: Unit root test taking into account endogenous structural break					
Saikkonen-Lütkepohl (2002) <sup>f</sup> (H <sub>0</sub> : nonstationary series taking into account endogenous structural break)	In level	-1.85	-2.16	-1.83	-1.57
	In 1st difference	-10.88**	-5.70**	-11.32**	-4.64**
Panel C: Unit root test taking into account exogenous structural break					
Saikkonen-Lütkepohl (2002) (H <sub>0</sub> : nonstationary series taking into account exogenous structural break in September 2008)	In level	-2.08	-2.28	-1.87	-2.95
	In 1st difference	-10.12**	-6.65**	-11.86**	-4.53**

<sup>a</sup> Unit root tests performed for cumulative return on each stock market index in terms of the local investor's currency, during the period from January 1998 to November 2010. The data source is CMA Trade. <sup>b</sup> *t*-statistic reported with respective p-values in the box brackets. Lag length: Schwarz information criterion. <sup>c</sup> *t*-statistic reported with respective p-values in the box brackets. Bandwidth: Newey-West. <sup>d</sup> *P* statistic reported. Lag length: Schwarz information criterion. <sup>e</sup> Result reported considering all modified tests:  $M\hat{z}_a$ ,  $M\hat{z}_t$ ,  $MSB$  e  $MP_T$ . Lag length: Schwarz information criterion. <sup>f</sup> *t*-statistic reported. Lag length: Schwarz information criterion. Shift function: shift dummy (In level) and impulse dummy 1<sup>a</sup> (1st difference). Critical values at 5% level: -3.03 (In level) and -2.88 (1st difference). \* Indicates the rejection of the null hypothesis at 5% level. \*\* Indicates the rejection of the null hypothesis at 1% level.

### Analysis of multivariate cointegration

In light of the equal order of integration, we analyze the multivariate cointegration aspect, based on the test proposed by Johansen et al., (2000). The result of this test, incorporating the structural break in September 2008 identified by the Chow test, utilizing one lag according to the Schwarz criterion and considering intercept and trend, indicates the existence of a single cointegration vector at the 5% level of significance, based on a trace statistic of 70.93. Besides identifying the rank of  $\psi(1)$ , this methodology also allows us to estimate simultaneously, through maximum likelihood, the cointegrating vector,  $Z_t$ ,<sup>11</sup>

$$Z_t = 1.00 IBOV_t + 0.93 RTS_t - 2.69 SENSEX_t + 0.32 SSE_t + 0.64$$

(0.28)            (0.44)            (0.27)

as well as, the implied reduced-rank VECM,

$$\begin{aligned} \Delta IBOV_t &= -0.08 Z_{t-1} + 0.23 \Delta IBOV_{t-1} - 0.04 \Delta RTS_{t-1} - 0.10 \Delta SENSEX_{t-1} + 0.01 \Delta SSE_{t-1} - 0.11 dummy + 0.05 \\ &\quad (0.03) \quad (0.14) \quad (0.11) \quad (0.15) \quad (0.12) \quad (0.07) \quad (0.02) \\ \Delta RTS_t &= -0.11 Z_{t-1} + 0.60 \Delta IBOV_{t-1} + 0.00 \Delta RTS_{t-1} - 0.40 \Delta SENSEX_{t-1} - 0.19 \Delta SSE_{t-1} - 0.18 dummy + 0.04 \\ &\quad (0.03) \quad (0.14) \quad (0.11) \quad (0.15) \quad (0.12) \quad (0.07) \quad (0.02) \\ \Delta SENSEX_t &= +0.01 Z_{t-1} + 0.03 \Delta IBOV_{t-1} + 0.04 \Delta RTS_{t-1} + 0.04 \Delta SENSEX_{t-1} - 0.04 \Delta SSE_{t-1} + 0.05 dummy + 0.02 \\ &\quad (0.03) \quad (0.12) \quad (0.09) \quad (0.13) \quad (0.10) \quad (0.06) \quad (0.02) \\ \Delta SSE_t &= -0.02 Z_{t-1} - 0.07 \Delta IBOV_{t-1} + 0.04 \Delta RTS_{t-1} - 0.02 \Delta SENSEX_{t-1} + 0.02 \Delta SSE_{t-1} - 0.02 dummy + 0.02 \\ &\quad (0.03) \quad (0.11) \quad (0.09) \quad (0.12) \quad (0.10) \quad (0.06) \quad (0.02) \end{aligned}$$

### Individual trends and cycles

In Figure 2, we plot the evolution of the decomposition into cycle and trend for each stock index.

The comparison of the cumulative return on stock market series and their respective individual cycles and trends allows us to infer that during the period of relative international stability, between 2000 and 2006, BRIC financial markets were driven by the trends instead of cycles, i.e., they were driven by economic fundamentals instead of global or local financial risk drivers.

However, in 1999, after the Russian crisis and during the Brazil problem with exchange rate, idiosyncratic reactions of BRIC stock indices, characterized by individual cycles, have greatest magnitude (predominantly negative), even when compared with reactions during the recent global crisis.

<sup>11</sup> In our normalization, the IBOVESPA parameter is unitary.

In the period preceding the start of the most recent crisis, in 2007, in all financial markets there are two distinct and evident periods of successive negative shocks, whilst during the turbulent year of 2008, there are essentially positive cycles, with high values, comparable to those obtained for the respective trends. The post-crisis period is characterized by negative and positive cycles. IBOVESPA and RTS indices show the most volatile cycles, with extremes of greater magnitude.

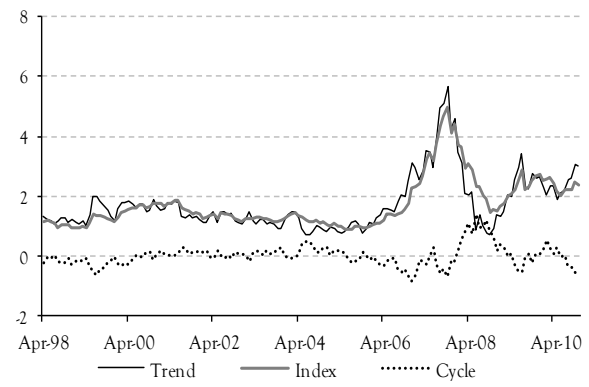
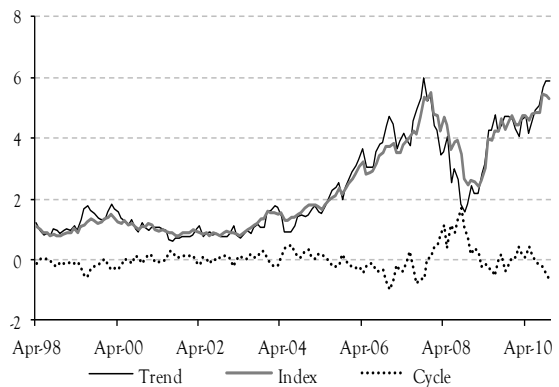
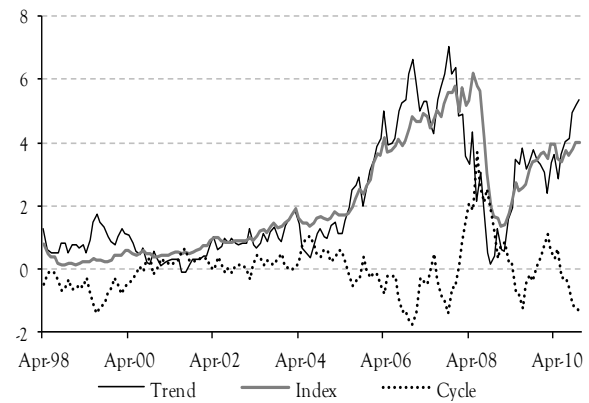
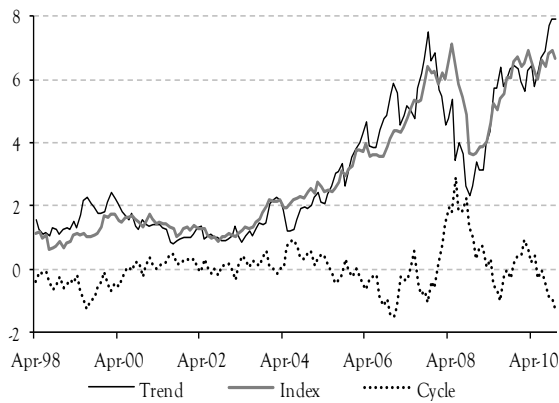


FIGURE 2. EVOLUTION OF THE CUMULATIVE RETURNS AND OF INDIVIDUAL TRENDS AND CYCLES OF BRIC STOCK MARKET INDICES<sup>a</sup>

<sup>a</sup>The methodology used to identify individual trends and cycles takes into account the structural break identified in September 2008.





### *Common trends*

According to Matos et al. (2011), over the period from 1998 to 2007, the first of the three convergence clubs considering cumulative returns is composed of stock indices in economies classified as emergent or developing, with highlight on the presence of three of the four BRIC countries. China market is the exception. Other previous evidences of partial or full integration in BRIC, based on exercises with macroeconomic or financial variables, are reported in Bai (2009), Misra & Mahakud (2009), and Chittedi (2010), among others.

These studies have a common aspect: they used to cover a period characterized by local financial crisis only. Here, we go a step further in this discussion: BRIC are financially integrated and establish a mutual relationship of long-term financial equilibrium based on three common stochastic trends (Figure 3), an evidence robust to a structural break identified due to the recent global crisis, in 2008.

As can be seen, the evidence of three common trends, distinguishable mainly as of 2004, suggests that over the long run we can consider three scenarios in sample and for the next decade, if the 1998/2010 outlook were to be repeated, even it seems to be highly unlikely.

Common trend #1 reflects a possible converging trajectory for BRIC financial markets, following the similar behavior of the respective indices throughout the period, but more extremely, as a signal of continuance of the recovery path after the 2007 financial crisis. However, BRIC can follow negative risk drivers still incorporating the effects of the recent crisis, without recovery of these stock markets, which follow two possible and very close common trends, #2 and #3.

Regarding the individual trends, they seem to be mutually comparable. Until the crisis, the indices' trends are moving together, with a smaller detachment only for the Chinese index, as we have observed in the evolution of the cumulative returns (Figure 1). The trend of the SSE is the least volatile and shows the lowest average trend, 1.72, while the other indices' average trends are greater than 2.00.

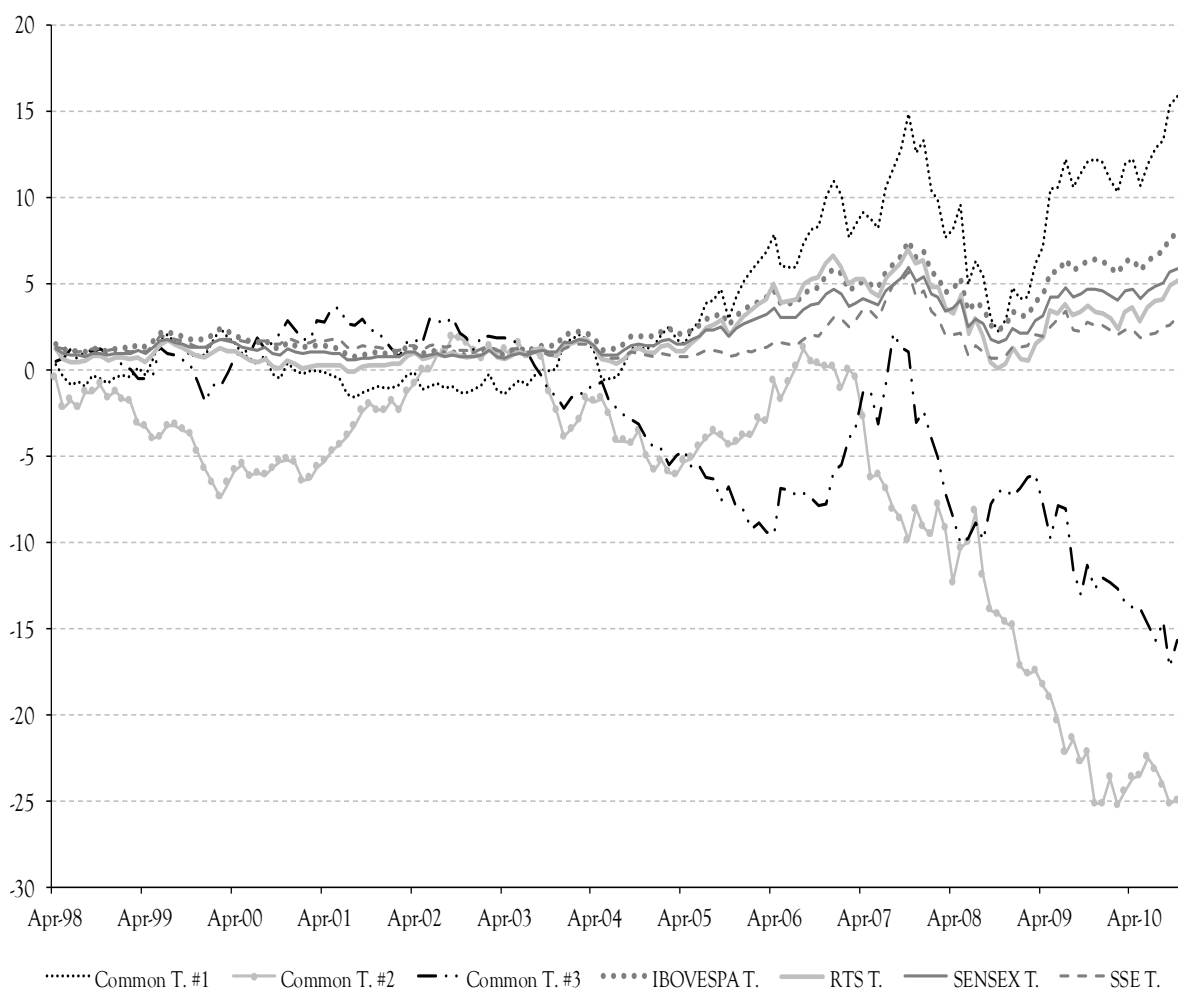


FIGURE 3. EVOLUTION OF THE INDIVIDUAL AND COMMON TRENDS OF BRIC STOCK MARKETS INDICES<sup>a</sup>

<sup>a</sup>The methodology used to identify individual and common trends takes into account the structural break identified in September 2008.

### *Common cycles*

Aiming to evidence if the hypothesis of contagion holds, we test for the existence of common cycles taking into account the break in September 2008. Based on a likelihood ratio statistic of 12.116 in a test with 12 degrees of freedom, the null hypothesis of having at least one common cycle in BRIC countries cannot be rejected at 5% significance. We report the individual cycles and the unique common cycle in Figure 4.

The individual and common cycles are perfectly comparable. They seem to have similar patterns over time, with the common cycle being less volatile than the individual ones. All the indices of these emerging economies shift away from their respective trends more negatively in December 2006, before the financial crisis. Considering only turbulent periods, the Brazilian and the Russian indices react more

intensively during the own crisis in 1998-1999, while the Indian and the Chinese economies are more negatively influenced by deviations during the global crisis.

The highest positive shocks occur in June 2008, with highlight in both cases for the RTS index, with larger negative and positive cycles. The Russian values are substantially greater than the extremes of the other individual cycles and the common cycle and are comparable only to Brazilian cycles.



FIGURE 4. EVOLUTION OF THE INDIVIDUAL AND COMMON CYCLES OF BRIC STOCK MARKETS INDICES<sup>a</sup>

<sup>a</sup>The methodology used to identify individual and common cycles takes into account the structural break identified in September 2008.

Consequently, the Russian index has the most volatile individual cycle, followed by the IBOVESPA, both being more volatile than the common cycle. The Chinese and Indian indices present the most stable behaviors in terms of cycles, including when compared to the common cycle. We present cycles statistics in Table 3.

TABLE 3. BRIC STOCK MARKET INDICES: INDIVIDUAL AND  
COMMON CYCLES<sup>a, b, c, d</sup>

Panel A: Correlation between common and individual cycles					
Cycles	Common	IBOVESPA	RTS	SENSEX-30	SSE
Common	1.000				
IBOVESPA	0.832	1.000			
RTS	0.831	0.992	1.000		
SENSEX-30	0.551	0.921	0.914	1.000	
SSE	0.759	0.988	0.981	0.956	1.000

Panel B: Summary statistics of common and individual cycles					
Cycles	Common C.	IBOVESPA	RTS	SENSEX-30	SSE
mean	-0.004	1.316 e -08	1.316 e -08	-1.461 e -17	1.974 e -08
standard dev.	0.394	0.681	0.809	0.368	0.357
minimum	-0.868	-1.525	-1.768	-1.002	-0.854
maximum	1.954	2.917	3.684	1.675	1.422

Panel C: Granger causality between common and individual cycles				
Causality	IBOVESPA	RTS	SENSEX-30	SSE
Common cycle $\Rightarrow$ Index	F = 1.264 [0.263]	F = 3.581 [0.060]	F = 8.683* [0.004]	F = 1.535 [0.217]
Index $\Rightarrow$ Common cycle	F = 5.038* [0.026]	F = 2.996 [0.086]	F = 4.761* [0.030]	F = 6.203* [0.014]

Panel D: Granger causality between individual cycles				
Causality	IBOVESPA	RTS	SENSEX-30	SSE
IBOVESPA		F = 6.426 [0.012]*	F = 8.435 [0.004]*	F = 0.860 [0.355]
RTS	F = 0.177 [0.675]		F = 8.810 [0.004]*	F = 1.471 [0.227]
SENSEX-30	F = 1.277 [0.260]	F = 0.707 [0.402]		F = 1.270 [0.262]
SSE	F = 0.144 [0.705]	F = 1.797 [0.182]	F = 9.571 [0.002]*	

<sup>a</sup> Statistics of the monthly series of common and individual cycles, during the period from April 1998 to November 2010. <sup>b</sup> The correlations reported are uncentered. <sup>c</sup> The Granger causality test uses only one lag. Respective p-values are reported in the box brackets. <sup>d</sup> At Panel D, each entry refers to the result of the Granger causality of the respective row indice on each column indice. \* Indicates the rejection of  $H_0$  (no Granger causality) at 5% level.

Based on the statistics (Panel A) the cycles of all indices are positively and robustly correlated, which suggests that the direction of the short-term movements caused by



transitory shocks is the same in the four indices, but with different intensities. In terms of predictive power, our procedure based on Causality tests between cycles is quite similar to Gray (2009). The analysis of the individual cycles (Panel D) suggests possible paths to be trailed by the contagion effect in BRIC. The Brazilian and the Chinese stock markets seem to be the first ones to react to global shocks, so that they are able to predict the common short run deviations and the Indian individual cycles.

Regarding the causality tests involving the common cycle (Panel C), the Russian market, whose individual cycle can only be predictable by the Brazilian cycle, is the unique useless to predict the common cycle.

Finally, we need to mention that the series used here do not address the question of exchange rate risk, but rather consist of the evolution of the aggregate market value of the main listed companies of each of the countries, from the perspective of the respective local investors. Hence, these results should not be used for making inferences on international diversification, but rather should be taken as a contribution to the discussion on financial integration and contagion.

## DISCUSSION

We identify the Brazilian and Chinese financial markets, as capable to exert relatively higher influence in the short run. We claim that worldwide investors should consider reactions in those markets during crisis as a predictor of other BRIC reactions through the contagion channel, while policy makers should attempt to the level of contagion observed here, given its relevance when evaluating the effectiveness of interventions and financial assistance packages after crisis. But, what these markets have in special?

Any explain for an influence exerted by China is obvious, since this country is in the top five world ranking for trade in services or merchandise, considering export or import, is the largest trade partner for each of the other BRIC, has the highest average yearly GDP growth rates during the period from 2001 to 2010, 10.5%, and its market capitalization size accounts for more than US\$ 5.6 trillion in 2010.

The numbers for Brazilian economy are more unpretentious. Brazil has the second higher level of net foreign direct investment flow in 2010, US\$ 36.9, lower than Chinese level, according to Mathur & Dasgupta (2013). Observing data of trade intra-BRIC, this economy is the second most relevant trade partner for rest of the BRIC, with a trade share of 24.3%. Under a financial perspective, the annual trade volume of US\$ 800 billion in BMF & Bovespa is the second in the rank of BRIC main stock exchanges, lower than Shanghai Stock Exchange level, only and its index, IBOVESPA, presents the highest cumulative return of 564.04%, from 2001 to 2010.

The Russian financial market, like a strange in the nest, also deserves our attention, since we fail to reject the null hypothesis in most Granger causality tests involving RTS index. This is the lowest market in terms of capitalization size, based on absolute and also relative values and the annual volumes in Moscow Exchanges are also the inferior limit comparing to other BRIC stock exchanges.

In the long-run, the evidence about three common scenarios suggests that BRIC financial markets are linked, even in an environment where we still do not observe a higher and desirable level of harmonization of respective stock markets with the international rules and regulations. In other words, they need to institute new regulatory frameworks concatenated within the bloc and they still should care about the inefficient government bureaucracy, corruption and inflation. As emphasized in Chittedi (201): “[...] Financial integration is key to delivering competitiveness, efficiency and growth. But will integration also bring about financial stability? Not necessarily. Strong framework rules, closer cooperation and in particular a readiness to share information and coordinate action across borders are necessary complements.”

In general, these reforms and liberalization initiatives depend on the removal of government monopolies, measures to increase domestic competition and policies capable to attract foreign portfolio flows. More specifically, China is reforming laws to foster stock market development and promote substantial liberalization in the financial sector, while in India, reforms have been introduced since 1992 in order to promote private sector competition, because the financial services used to be dominated by state owned companies.

A similar scenario can be observed in Russia, which is implementing a gradual privatization of banking system. In Brazil, because of liberalization, among the top 50 banks, 20 are foreign controlled private banks (See Mathur & Dasgupta, 2013 for further information about reforms in BRIC financial services).

This result could also motivate a globalization intra-bloc in terms of alliances of the respective stock market exchanges. Together, this bloc market capitalization is of US\$ 10.5 trillion in 2010, which is higher than the volume of any G7 economy, except USA. Instead of an intra-bloc alliance, what we can observe in a recent historical of globalization is the merging involving derivatives and stock exchanges in a same country, as the Brazilian experience in 2008, or alliances as the entering process of BATS Global Markets in the Brazilian market.

Stronger securities market provides the internationalization of an economy by linking it with the rest of the world, which is essential for BRIC economies, whose levels of market capitalization are lower than 80% of the respective GDP's, except for India. We could also expect a cross-border capital flow increase as well as a more representative presence of Indian companies with stock listed in other BRIC stock exchanges, for example.



It is also relevant in order to raise the levels foreign direct investment intra-bloc and involving other economies. The share of BRIC economies in global FDI flows in 2010 is 17.7% and 11.0%, considering inflow and outflow respectively. A key element in this purpose is strengthening the presence of BRIC financial firms around the world, which seems to be implemented by Chinese and Brazilian banks more intensively. We may also expect an increase of the bloc's importance in trade scenario, since this bloc accounts only for 9.4% and 12.0% of worldwide export and import, respectively (See Guell & Ricahrds, 1988 for an evidence about the relation between integration and trade in Latin America).

## CONCLUSION

When an ad hoc acronym is coined by financial market, researchers use to analyze if there are fundamentals to support such creation and then suggest to policy makers how take this kind of opportunity in order to improve social welfare. This is what we do here: we infer how appropriate in financial terms is the use of BRIC, which enables us to support policy makers' decisions. This a relevant and nonconsensual issue to be addressed, because for one side, BRIC has common features identified in the literature, but for the other side, BRIC economies have heterogeneous profiles in terms of the cultural, political, social, demographic and macroeconomic contexts, or also observing human capital and labor market variables.<sup>12</sup>

In this controversial context, our main findings corroborate previous studies suggesting that their main stock market indices share short- and long-run equilibrium relationships, thus indicating that there seems to exist high levels of integration and contagion of BRIC financial markets.

To summarize, everyone knows that financial markets are already looking for the next BRIC countries and there is no shortage of candidates. Therefore, if BRIC economies still desire to attract the attention of investors, researchers and policy makers, their integrated stock markets may play an imperative role to contribute to both capital accumulation and technological innovation. Only in this way, by 2020, in a scenario of economic growth and considering inflationary effects, this block will account for a third of the global economy (in PPP terms) and contribute about a half of global GDP growth. Otherwise, even Jim O'Neill, who coined this acronym, will advocate that BRIC economies should be included in an expanded G7.

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<sup>12</sup>According to Wilson and Purushothaman (2003), macroeconomic, institutional, financial-commercial openness and educational factors need to be improved for the BRIC nations to meet their projected growth levels. Bell (2011) indicates that common aspects continue being a hindrance to the development of the bloc's countries: inefficient government bureaucracy, corruption and inflation, among others.

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# HOUSEHOLD ANTICIPATION AND THE RISE OF BANK FRAGILITY IN THE TUNISIAN CONTEXT

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## Abstract

*The current paper attempts to explore the effect of Household anticipation on the banking fragility through using the dynamic panel data methods estimated between 2005–2015 on around 18 Tunisian banks. We found that the anticipation is the main factor leading to an increase in the bank fragility. In the long run, the increase in the bank fund has to be accompanied with an increase in the bank fragility. Therefore, the bank fragility rise is more affected by borrowers and investors than depositors and tourist anticipations. Bad economic environment affects more the bank fragility. Those empirical facts therefore support our theoretical findings.*

## Key words:

*Non-performing loans; Household anticipations; Dynamic panel data*

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## INTRODUCTION

Although it is widely believed by the microeconomics classic banking theories that credit markets-is linked to firms practices, and households are first and foremost considered as fund suppliers rather than debtors, households lending has taken a great part in banks' balance sheets and other financial intermediaries, as well as in the financial markets' operation along with the real economic activity. Moreover, liquidity risk and credit risk are closely linked. Both industrial organization models of banking, such as the Monti-Klein framework, and the financial intermediation perspective in a Bryant (1980) or Diamond and Dybvig (1983) setting, suggest that a bank's asset and liability structures are closely connected, especially with regard to borrower defaults and fund withdrawals. Based on these models, a body of literature has recently evolved focusing on the liquidity and credit risk origin, interaction and the implications for the bank stability. Credit risk and liquidity risk result from creditors and debtors anticipations. Depositors and investors lose confidence in the

bank. They change their doubts about its solvency. They change their anticipations and withdraw their deposits. The bank illiquidity is therefore vulnerability not only to the bank itself but also to the financial and economic system as a whole. The Asian countries financial crisis like Thailand "first crisis of globalization" was amplified by the increased liquidity risk in banks caused by the households and the investors anticipations changes. For instance, one approach, developed in particular by Chang and Velasco (2002) shows that the South Asia crisis resulted from the boom of bank credit induced a significant inflow of capital and followed unexpected withdrawals and cause liquidity problems and, therefore, bank failures in chain (Tirole, 2012). The financial crisis stretched even to other sectors, as well as to the primary sector industries and services.

The Thailand crisis, amplified by the spread household herding behavior is spread to a large part of Asia in 1997 and 1998 strikes Korea, Malaysia, Indonesia and the Philippines (Aglietta et al. 1997). Similarly, the Argentina crisis (1998 and 2002) resulted from the liquidity crisis. Our study contributes to two threads of literature. For the depositors anticipation theories, and liquidity risk, these are the seminal works of Diamond and Dybvig (1983) which have been complete, refined and useful by e.g. Diamond and Rajan (2001), and most recently "random effect" theory (Chang & Velasco, 2000, 2001). The debtor's anticipations and credit risk studies were based on Leaven & Levine (2009), and Imbierowicz & Rauch, (2014). The remainder of the paper is structured as follows. Section 1 provides the theoretical background for our analysis. It presents a review of the literature related to household and investors anticipations and behavior. It deals with the relationship between liquidity risk and credit risk in banks and bank stability. However, section 2 describes the data including our proxy variables for depositors and debtors' behavior, liquidity and credit risk and presents descriptive statistics and ensures detailed information about the adopted methodology in this paper. Nevertheless, section 3 presents household financial fragility estimates, the conclusion and some useful suggestions for the bank future.

## **LITERATURE REVIEW**

### *Investors and debtors anticipation and bank fund stability*

The changes in investors' anticipations lead to capital flight, a net decrease in the confidence of private creditors; bank withdrawals. Therefore, liquidity risk vulnerability is not menacing only to the bank itself, but also the financial system. Interest in the role of household behavior in the incidence of the liquidity risk on banking fragility. Liquidity risk is banking vulnerability which consequences are: shareholders and bank creditors (depositors, insurance) financial costs and loss of banking industry competitiveness. New challenges are profiled on the horizon and setting evidence of the impact of mimetic behavior of households due to changes in their anticipations about the credit policy are the basis of this research. Despite the ambiguous economic theories according to the deposits behavior role in the bank



liquidity risk, they are due to the household unsteady behavior. It is viewed as a main source of bank variability. According to the "random effect" theory (Chang & Velasco, 2000 and 2001), the bank run is a "self-fulfilling phenomenon" that is not related to the fundamental (switch grass-based models). It is then a self-fulfilling prophecy, and the anticipation is the crisis phenomenon origin.

Related to the information theory "theory based", the bank runs into a depositors' collective behavior. In this case, the depositors are so misinformed. In other banks, depositors are well informed and this would have positive information on their own banks assets. But they may nevertheless withdraw their funds and move them outside the banking system. They ignore their own information and follow the "crowd". So there is a contagion mechanism and "runs" generalized yet on healthy banks (End 2011). Driven by the need to preserve their customer's confidentiality and regardless of the little depositor's information, the bank tried to understand the financial position of the depositors and the withdrawal anticipation (Guttentag & Herring, 1987). In fact, the depositor's runs are related to random events such as the unemployment, which drops the household's real income. Household became unable to save their funds already deposited in prosperity times.

The inflation, the external shock, economic activities turn down, unexpected events are resulting from a poor return, a fear of foreign invasion, an unexpected failure of a large bank in which each had confidence. This makes investors risk more averse. The household anticipations become the focus of both monetary authorities, as economic theories. Confidence is the major deposits stability factor in the bank. Depositor confidence is a phenomenon far too random. It cannot be managed endogenously by banks. For example, during the Argentina banking crisis, Chile and Mexico during the period of 1994-1995, depositors distinguished bad banks and lost their trust in them. They withdrew their deposits as "a bank punishment". Generally, depositors do not give confidence to the bank because they remain uninformed about the bank fund. An intervention of a public agency would ensure the banking system stability ("Deposit Insurance" or "lender of last resort"). Small depositors have neither the means nor the expertise to supervise the bank. They did not withdraw their deposits from their own bank if they have a credible and explicit government guarantee on these transactions balances. Thus, one of the most evident lessons from the current crisis was the need to build insurance mechanisms and means of small deposits. Strengthening prudential regulation is critical to limit moral hazard of banks (Aglietta, 2001). In the same line of idea, Banks liquidity risk is generated not only by the creditor's anticipations but also by the debtors. ... While Diamond and Dybvig (1983) attribute bank runs to the random events result (unstable behavior of the applicants), Jacklin and Bhattacharya (1988) and Chari and Jagannathan (1988) estimate that the bank asset's risk lead to run. In economic downturn, investors expected an ability to

pay back banks loans decrease. Even worse, it leads to the bankruptcy or liquidation of companies and therefore the increase in unemployment. Real household income thus decreases. They cannot repay their debts. The non-performing loans raise has a restrictive effect on the bank liquidity and therefore on the bank stability. Insolvent debtors lead to the bankruptcy. In a situation, a credit shock wide liquidity shock. The bank ability to take new commitments (Aglietta et al., 2009) decreases. A loss of credits prevents also the bank satisfying depositor's demand. Such information, lead to depositors herding behavior (Imbierowicz & Rauch, 2014).

### *The relationship between liquidity risk and credit risk in banks and bank stability*

Classic theories of the microeconomics of banking dealt with banks' liquidity and credit risks. Based on the classic financial intermediation theory, such as the Bryant (1980), and Diamond & Dybvig (1983) models and their extensions (such as Diamond, 1997), and also by the Monti-Klein model of banking organizations. The models propose that, there is a relationship between liquidity and credit risk. The Monti Klein framework and its extensions (Prisman et al., 1986) take borrower defaults and unexpected fund withdrawals, both lead to less bank's income. As other debt funding, equity and bank securities are considered as exogenous, banks generate profits by maximizing the spread between the deposit and loan rates.

At least in theory, the liquidity and the credit risks should thus be positively correlated. This hypothesis is provided by the theoretical financial intermediation literature, as modeled by Bryant (1980), as well as Diamond and Dybvig (1983). Risky bank assets linked to uncertainty about the economy's liquidity requirements lead to bank runs and pure panic (Iyer & Puri, 2012). Consequently, liquidity and credit risk contribute together to the bank instability. Anecdotal evidence from this link during the recent financial crisis of 2007/2008 further supports these theoretical and empirical results, such as Acharya & Ouarda (2012), Klomp & Haan, (2015), and Schroth et al., (2014). If the bank assets deteriorate in value, more depositors will expect the losses of their fund and they will withdraw them. The main result is that the higher credit risk goes with higher liquidity risk through depositor anticipations. A very recent and still developing monetary literature as Acharya & Naqvi (2012), Ponce & Rennert (2015) propose that the liquidity risk is negatively correlated to credit risk.

## **BACKGROUND ABOUT BANK FINANCIAL FRAGILITY**

From a theoretical perspective, the link between liquidity risks resulting from depositor's anticipation and credit risks from inventor's anticipation seems to be clearly proved. These episodes give rise to a question: *how do the economic actors' anticipations affect the bank's fragility?* We describe the literature clearing up financial distress. Banks fragility studies contributed in clarifying loan commitments (secured and/or unsecured, i.e. mortgages and/or consumer credit). In this research area, when we investigate literature about household, investors and financial fragility, this phenomenon was considered as one's inability to repay financial debt (Guglielmo al.,





2014). Then, based on a self-reported indicator of financial distress, Del Rio & Young (2005) investigated unsecured household debt, resulting from investors or households' anticipations, and proved that they have indebtedness difficulties revealing a given personal bankruptcy rate (Dick & Lehnert, 2010). As a result, subjective measures of financial distress are linked to other indicators extending the probability of indebtedness default (Del Rio & Young, 2005).

In addition, the empirical findings revealed that the ratio of unsecured debt to income is assumed to be a distinguished factor determining financial instability. The unsecured young households' debt raise combined with a high debt-ratio was due to the household's potential financial shocks that their anticipation change is based on their income and also on the increase in interest rates. In short, the indebtedness anticipation and financial vulnerability are a multidimensional phenomenon which requires an analytical analysis allowing discovering its major and hidden causes. With regard to households' indebtedness and financial vulnerability, we will present, in the following section, our adopted methodology, the description of the major targeted variables, and also the results and interpretations of the estimated Tunisian households.

## **METHODOLOGY, RESULTS AND DISCUSSION**

### *Descriptive statistics*

The main variable deals with the household and borrowers anticipations. The database covers 18 banks observed between 2005-2015. These banks represent 80% of the whole banking sector, and would serve to analyze the household's anticipations and financial fragility. The household deposits and credits are taken from the Tunisian Central Bank (TCB). It is worth mentioning that household behavior and attitude change considerably over the period 2005-2015, as indicated in Figure 1.

This justifies the legitimacy of investigating these noticeable cross-bank differences which are dependent on the rate of household lending and borrowing. The latter affects the bank stability. In short, Table 1 presents the bank specific variables used in the econometric analysis and their corresponding specific hypothesis. After reviewing the main specific variables as factors of the bank fragility, it sounds interesting to empirically validate our hypotheses in the case of the Tunisian Banking system.

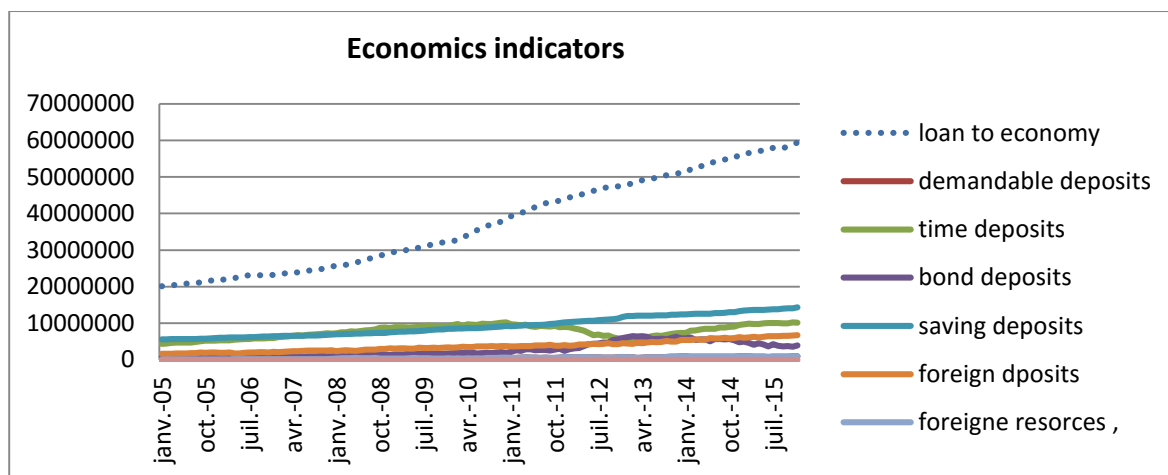


FIGURE 1. BANK RESOURCES AND ABILITIES EVOLUTION

### Time series histogram

TABLE 1. THE DESCRIPTIVE STATISTICS OF THE VARIABLES

	Bond deposits	Demandable Deposit	Foreign deposits	Loans to the economy	Foreign currency	Savings deposits	Time deposits	TUNIDEX	NPL
Mean	2768749	488877.5	3702337.	37324510	488877.5	9240152.	7773652	3790.755	40852369
Median	1888500.	487984.5	3628185.	35817457	487984.5	8689673.	8052045.	4404.290	55646507
Maximum	6468500.	982245.0	6731338.	59423725	982245.0	14352231	10231836	5718.940	75287654
Minimum	807500.0	39871.00	1657779.	20108166	39871.00	5591951.	4353439.	1312.330	10105874
Std. Dev.	1869426.	285345.7	1446508.	12649907	285345.7	2697963.	1709235.	1292.931	22649907
Skewness	0.657195	0.058989	0.453014	0.205244	0.058989	0.323689	-0.294858	-0.454393	-0.236651
Kurtosis	2.919237	3.803180	3.158110	3.589412	3.803180	2.734813	1.764642	3.811183	2.369214
Jarque-Bera	15.92619	7.954638	8.413151	11.87043	7.954638	11.10888	10.30630	12.31548	7.258251
Probability	0.000348	0.018736	0.014897	0.002645	0.018736	0.003870	0.005781	0.002117	0.006541

In the current paper, we consider a panel of eighteen Tunisian banks. Table 1 presents the descriptive statistics of households' NPLs for all eighteen banks and the variables included in our empirical analysis. The results show that the average of NPL of the studied sample is about 40852369. The minimum value of the recorded ratio of NPLs is 10105874 while the maximum is 75287654. Although the average rate of household's NPLs is high, the banking sector in Tunisia is still characterized by a high level of NPLs.

Clearly, all variables average is positive and std. dev. scalar is high during the period. In addition, demandable deposits, foreign currency, loans to the economy, tunindex market have kurtosis values that are higher than three. They are also the most volatile factors exhibiting the highest positive Skewness and having the Kurtosis excess. This implies that the distribution has a long right tail and is relatively peaked to the normal. Therefore, it is worth noting that these variables are risky as they can take extreme values. Thus, the Jarque-Bera test indicates that the normality assumption is rejected for all factors. Furthermore, checking the stationary, the results from the P value tests indicate that series are not stationary. Henceforth, those econometric characteristics let us conclude that most time series are volatile over the time.



### Time series decomposition

Decomposition technique is a method for decomposing time series into permanent and transitory components. Note that this method, unlike traditional methods, considers the trend as a stochastic process. The Hodrick–Prescott filter is useful to time series decompositions for the analysis. Each time series is decomposed to trend and cycle (Norden, 2004).

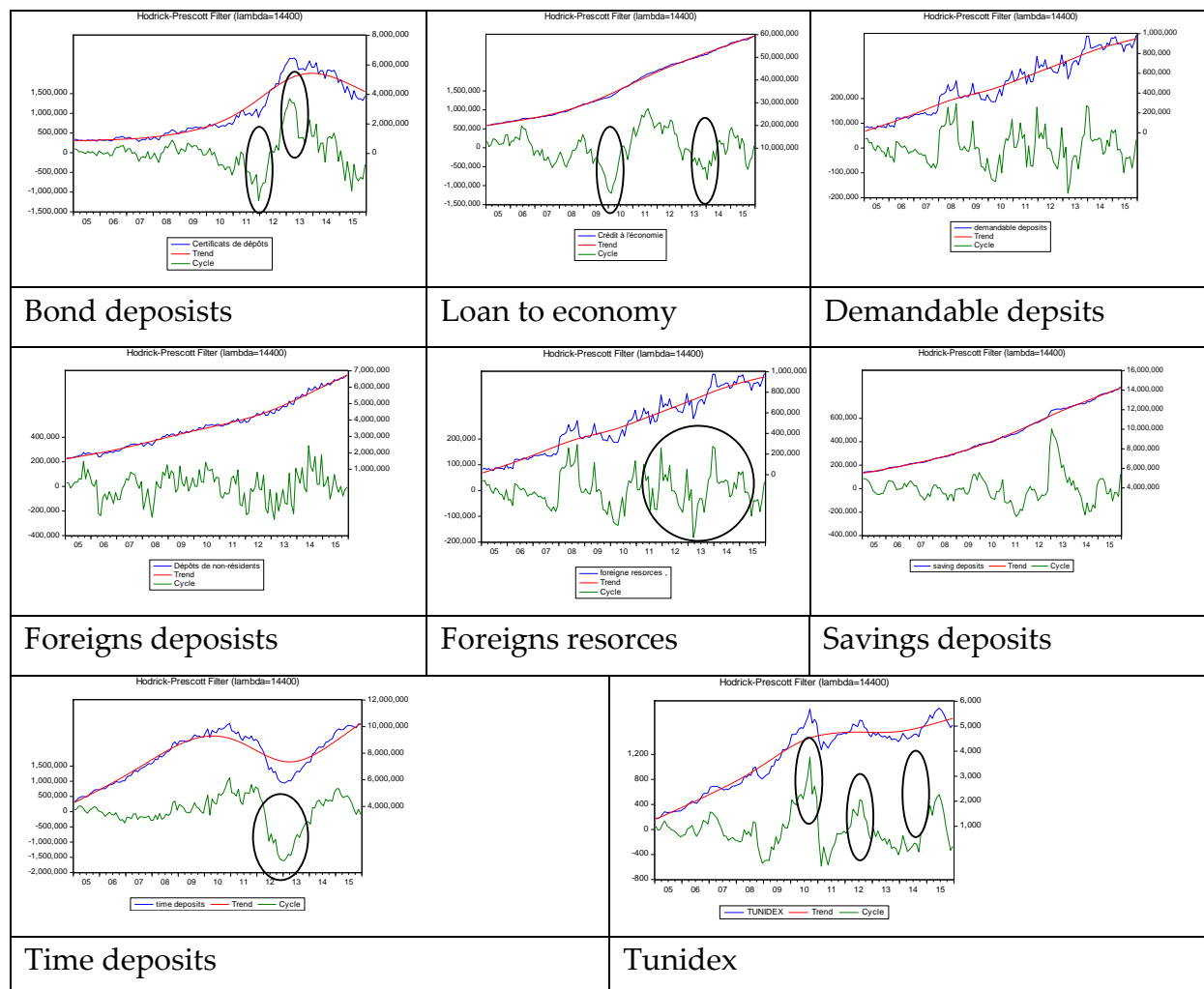


FIGURE 2. TIME SERIES IS DECOMPOSITION

Bank's deposits are the main bank resources. These funds, deposited by the resident and non-resident household, can be withdrawn directly from the bank. Such behaviour can be underscored by the decomposition of deposits series. Bond deposits, foreign resources, saving deposits and time deposits HP trend curve tends to increase with almost volatilities after the revolution event. They show some peck in 2011 (revolution) 2013 and 2015 (Period of election, Sousse terrorist attack). The significant variability of deposits, which is relative to the average lefts, affirms the random effect

of these resources. The Foreign currencies are the second bank resources. In 2009, variability increased and peaked. The figure below suggests that foreign currency assets and foreign investor's anticipation change. The long term trend of foreign exchange earnings increases. The trend shows a slight decrease towards the end of the period (2010). In 2010, the situation has completely changed. The growth rate of currency plumping was due to internal and external economic factors. As the internal factors are concerned, the new political climate in Tunisia became unstable from the end of 2014 and thus had a combined effect on tourist anticipations and incomes.

On another level, the tourism sector has experienced a stagnation of entries by non-residents. Based on the histograms study and Hodrik Prescott filter, we can conclude that the Tunisian household behaviour is different in time. There are two periods: ordinary times and times of crisis. In ordinary times, the variability of the deposit growth rate is not a major problem since the fluctuations are dawdling. These can result from a seasonal behaviour which is usually approximate. However, in a household environment disturbing event (revolutions, economic crisis, terrorist attacks ...), these variabilities have large amplitudes. They become recurrent and unexpected. Besides, the kurtosis coefficient of different deposits is greater than 3 for deposits, deposit certificates and foreign deposits. Therefore, it is worth noting that demand deposits, deposit certificates and non-resident deposits are risky as they can take extreme values. If the household or foreign depositors meet a slight shock (unemployment, unexpected expenses ...), it withdraws deposits and foreign deposits. For other deposits (term deposits and savings deposits), the kurtosis coefficient is less than 3. The occurrence of extreme values for these deposits is rare.

Despite its unsteadiness, bank's savings remain a risky funding, since fluctuations increase more than decrease. This proves the realism of the Tunisian household and its rational anticipations as proved by Niinimäki (2002). If the household anticipates a slight shock, he will withdraw demandable and foreign deposits. If the shock anticipated becomes important, they will withdraw time and savings deposits. This rejects the Diamond and Dybvig (1983) conception and joined the information theory "based theory". Following the logic of this theory in Tunisia, the well informed household has positive information about the assets of his own bank, is interested in the different vulnerability in the country such as the revolution post period event (political event, terrorist attack....). In case of unexpected events (a bad return, poor economic situation, an unexpected failure of a large bank in which each had confidence) he anticipates a pessimist position and withdraws his funds (time deposits and savings) and redeposits them when the situation acclaims. They do not take into account their own information and follow the "crowd". The bank runs in Tunisia are not considered as self-fulfilling prophecies within the Diamond and Dybvig (1983) approach, related to the stochastic nature of withdrawals but they are related to hazards. The bankers and the monetary authorities aim is the investigation of factors that affects the household behaviour and change their anticipations, mainly



small depositors. The last period was marked by social turmoil and bad information about political corruption and the failing economic conditions (Barnea, 2015). According to Allen & Gale (2007), Roman & Sargu (2014), proposal, these withdrawals are random, and are not considered as self-fulfilling prophecies. As a result, the deposit convertibility suspension does not resolve the problem of bank run. The bank must find other alternatives for managing its liquidity problems. Banks need to protect depositors by a mechanism such as deposit insurance as well as the last period. The structure of deposits is based on demandable deposits. Banks tend to borrow short term, because short-term debt is less expensive than long-term debt (different interest rates). According to Rodrik & Velasco (1999) the maturity of the external debt of banks explains the self-fulfilling panic. Tunisian banks should encourage long-term deposits, at the expense of short-term, to serve as a financial basis to be distributed as loans.

Concerning currency resources, while the long term trend of foreign exchange earnings is rising, it drops from the end of 2010, 2014 2015. These resources also exhibit a seasonal pattern. Similarly, the coefficient of kurtosis, which is greater than 3, shows a probability of occurrence of distant values of the average. These resources are strongly linked to changes in the banking environment and thus to the foregone household anticipation. Similarly, fluctuations from one year depend on the movements of the previous year. The impact on these resources is amortized over several periods. This confirms the instability of these resources. They are strongly related to customer behaviour resulting from the economic and environmental factors. The loans to economy curve exhibit an upward trend especially from 2009. Foreign Direct Investments grew, but at a slower pace than in 2005. The cycle curve fluctuated in particular from 2009, when economic system was dominated by the political system. The public banks, with few deposits, had been, for the 23 years a source of funding for the former political regime.

Among 175 companies dominated by the president's family, almost a third (56 companies) is financed by the Tunisian Banking. Tunisian household became more averse to waste their found. Investors cannot repay credit. The curve has high peaks in 2014. This is due to the political election and some terrorist attacks that affect the investor's anticipation. The Tunindex curve shows two periods. The first was steady until 2010. The second is very fluctuant until 2015. This is due to the financial market liquidity which is closely linked to the political and economic externalities. In Tunisia, the market is illiquid as well as embryonic and this is usually considered as a sign of a non-developed financial infrastructure. As a conclusion, banks resources and liabilities are unsteady, insufficient and vulnerable to negative externalities which have become the main characteristics of the Tunisian banking environment that affect the economic actors anticipations such as depositors or borrowers . Given such

situation, a legitimate question in what is the link between liquidity shortage and credit risk?

## HOUSEHOLD FINANCIAL FRAGILITY ESTIMATES: RESULTS AND INTERPRETATIONS

In this section, we propose to check whether the household and investors as defined in the previous section, affect the banks financial fragility. Fragile banks are reluctant to make new loans (Andrianova et al., 2015b). Instead, they focus their efforts on deleveraging their balance sheets and strengthening their liquidity buffers in order to cope with deteriorating depositor confidence (Lagoarde-Segot & Leoni, 2013). Thus we approve Non Performing Loan growth rate as bank fragility indicators. We study data from 18 Tunisian banks during the period of the first quarter of 2005 to the fourth quarter of 2015. Panel data sets for economic research possess several major advantages over conventional cross-sectional or time-series data sets (Schularick et al., 2011) taking into account the unobserved heterogeneity between banks. To our best knowledge, this might be the first study dealing with this topic in the Tunisian context.

### *Econometric Model Presentation*

To explicate the Tunisian bank fragility, the following econometric model has been applied:

$$TCNPL_{it} = \alpha TCCE_{it} + \beta TCD_{it} + \gamma TCFC_{it} + \delta TCTUS_{it} + e_{it}$$

TCNPL: is the growth rate of the NPLs household ratio per bank,

TCCE, TCCD, TCFC, TCTUS: is growth rate of bank credit, deposits, foreign currency, market index

e = error term

TABLE 2. UNIT ROOT TEST RESULTS, IPS (2003)

	Without trend	With trend
LTCNPL	4.266	-1.852
$\Delta$ TCLNPL	-22.987*	-21.963*
TCCE	-1.654	-1.151
$\Delta$ TCCE	-16.358*	-16.987*
TCD	1.987	-1.258
$\Delta$ TCD	-23.951*	-23.702*
TCFC,	-1.658	-1.247
$\Delta$ TCFC,	-19.987*	-17.963*
TCTUS	2.587	-1.368
$\Delta$ TUS	-26.365*	-25.258*

Note. \* significant at 1%; \*\* significant at 5%; \*\*\* significant at 10%

These represent the model's basic variables, as generally applied in the literature, in order to clarify the Tunisian bank financial fragility. In fact, we assume that the NPLs behavior constitutes a dynamic process as its previous level well might explain the present one. NPLs at time captures the cumulative amount of the prior periods of

NPLs. Beside; the current TCNPLs ratio will certainly influence the banks' credit policy, and proves the borrower anticipation and inability to repay credit when he is pessimist. Therefore, it changes their future financial conditions" behavior and, so, the NPLs ratio. As a result, this proxy goes with the literature (Andrianova et al., 2015b; Loayza & Ranciere, 2006). Before proceeding with our model estimation, the unit root test needs to be conducted as a preliminary step. 6.1.1 Stationarity-Analysis Test the results from the IPS (2003) unit root test are listed in Table 2.

By applying this test on all the variables, in-level and in a first-difference, we notice that variables are non-stationary at a threshold of 5%. Equally, series, which lagged one period, are stationary. Then, as all series are integrated in the same order  $I(1)$ , we turn to test the possibility of an existing long-term linear relationship between these variables. This could be accomplished through applying a cointegration panel test. At a primary-difference step, the unit-root hypothesis appears to be rejected for the all variables. As a conclusion, one can notice that the whole panel series turns out to be integrated at an order of 1, as previously stated by the IPS (2003) statistics.

### Panel Cointegration Test

The cointegration concept could be defined as a systematic long-term co-movement between two or more economic variables (Wagner & Wied, 2015). In this section, Johansen (2014,) cointegration test is applied to prove the existence of a long-term relationship among the TCNPLs ratio and its determinants. The results of the cointegration test are presented in Table 3.

TABLE 3. COINTEGRATION TEST RESULTS, JOHANSEN (2014)

Without trend		With trend	
Tests	Statistics	Tests	Statistics
Panel v Statistics	0.22	Panel v Statistics	0.28
Panel q Statistics	-1.54	Panel q Statistics	- 1.95
Panel pp Statistics AD(PP)	-2.73	Panel pp (PP) Statistics	-1.54
Panel Statistics	1.54	Panel (ADF) Statistics	0.68
Panel q Statistics	2.98	Panel q Statistics	1.98
Panel (PP) Statistics	3.54	Panel (PP) Statistics	1.02
Panel (adf) Statistics	1.41	Panel (adf) Statistics	0.08

All statistics reject the no-cointegration null hypothesis since there exists a cointegration relationship between the indicator of bank financial-fragility (non-performing loans) and of the fundamental variables. Overall, Table 3 proves the existence of a cointegration relationship between the TCNPL and the fundamental variables that were cited below. According to the econometrical approach, and in presence of panel data, such a relationship can be further estimated by resorting to the Full Modified Least Square (FMOLS) method, as developed by Pedroni (1999).



### *Estimation of the Cointegration Relationships*

It is worth highlighting that the fact of applying Pedroni's (1999) test would only serve to check the extent to which a cointegration relationship exists between the bank non-performing loans and the applied variables. Once these tests confirm the cointegration of variables, the FMOLS estimation method could then be used. Applying the cointegration test on panel data requires the adoption of an adequate estimation method. Accordingly, a variety of methods can be distinguished. Among these, we may cite, for instance, Pedroni's FMOLS, the Dynamic Least Square Method (DOLS), the Generalized Moments Method (GMM), and the Maximum Likelihood (ML). Several authors, such as Phillips and Moon (1999) demonstrated that, in the presence of panel data, the FMOLS and DOLS methods lead to normally-distributed estimators. Moreover, Pedroni (1999) showed that the Least Square Method estimators are considered as super-convergent and that their asymptotic distributions are biased and depend on the nuisance parameters. The author also states that these problems could be noticed due to the presence of heterogeneity. The model estimation results via FMOLS are presented in Table 4.

TABLE 4. COINTEGRATION VECTOR ESTIMATION VIA FMOLS

Bank	Variable	Coefficient	t-statistic
All banks	LCE	2.05871	9.98772
	LD	-4.258745	3.258741
	LFC	- 1.236547	1.987452
	LTUS	- 1.258745	2.365478

Table 4 highlights the long-term relationship binding the TCNPL s to the f variables with regard to fundamental Tunisian banks resources and liabilities. Across all regressions in this section and subsequent sections, the coefficients of the ratio of none performing household loans are largely consistent with our expectation. For instance, the coefficients on deposits, currency and tunidex are negative and statistically significant, suggesting the probability of falling into long-term payment defaults. This proves that the households' bad anticipations can be the main bank disturbing factors and vice versa. Thus, the Tunisian and foreign households' anticipations and mimetic behavior can be serious banking problems, and then, to financial fragility (End 2011; Jappelli et al., (2008). The households' financial after revolution becomes even more precarious just as it is the case when the assets' value with regard to liabilities for most households, as any decrease in their incomes jointed to high index prices, would certainly affect their real income. Household and foreigner anticipate more and more distressing prospect. Turning to credit, the coefficients on TCCE are positive and statistically significant in general, confirming that credits are bad and banks with bad asset quality are prone to fail. Results suggest the go down of firm and household debt-reimbursement capacity, hence increasing their financial fragility. In fact, the household, foreigners and investors anticipations provide a real view about the reasons of economic and financial distress, and therefore, about the importance of this





fact which reflects that a high debt level could yield well serious financial problems (Anderloni, 2012). However, and with respect to our case study, this variable wasn't shown to be significant. This could be explained by the fact that we are dealing with gross disposable income per capita. Furthermore, the real interest rate also appears to have a positive and significant impact on the household non-performing loans. When referring to the existing empirical literature, we find that the link between the real interest rate and the non-performing loans' ratio is positive. In this context, Bofondi & Ropele (2011) have demonstrated that an increase in the real interest rate would immediately result in an increase in the debt charge, generating a high increase of risky and doubtful installment reimbursement (i.e. unpaid credits) and hence, a rise in household financial fragility. As for the last stage, the focus is on estimating the assessment of the error-correction model in the short term

### *Sensitivity Analysis: Estimating The Panel Error-Correction Models*

For the sake of robustness checks, we apply the econometric dynamic panel techniques in order to estimate and evaluate the error-correction models (ECM), as applied in our sample. Indeed, the ECM model is represented by the following equation:

$$\Delta TCNPL_{it} = \alpha_i \Delta X_{it} + \gamma_i (TCNPL_{it-1} - \beta_i X_{it-1}) + e_{it}$$

Where:

$TCNPL_{it}$  : the fragility indicator of bank  $i$  in year  $t$ ,

$X_{it}$  : the exogenous variables' vector of bank  $i$  in year  $t$ ,

$TCNPL_{i,t-1}$  : the indicators of the fragility of bank fragility  $i$  for the year  $t-1$ ,

$X_{i,t-1}$  : the vector containing the exogenous variables' set of bank  $i$  in year  $t-1$ ,

$\lambda_i$  : adjustment coefficient.

$\delta_i$  et  $\alpha_i$  the estimated parameters,

$i = 1, 2, \dots, N$  designates the banks, and  $t = 1, 2, \dots, T$  designates time.

Prior to treating the long-term relationship, the error-correction model is achieved in order to ensure the integration of the short-term fluctuations. In order to estimate the ECMs' indicator of bank fragility with the pertinent explanatory variables, we apply the Pesaran et al., (1996 and 1999) approach. In this respect, three major techniques are worth to be adopted since they are expected to secure the estimation of the ECMs in the panel:

- 1) the dynamic fixed-effects estimator' (DFE),
- 2) the pooled mean group estimates (PMG), and

3) the mean rroup estimates (MGP).

With respect to our case study, we have opted for the DFE estimation technique (Note 3). The global sample ECM estimation results are illustrated in Table 5.

TABLE 5. ECM DEPENDENT VARIABLE:  $\Delta$  TCNPL

Variable	Coeff.	Std Error	T-Stat.	Signif.
Constant	-2.363	0.587	-10.852	0.000
$\Delta$ CE	1.258	0.054	12.951	0.000
$\Delta$ FC	2.987	2.369	-0.987	0.258
$\Delta$ TUS	-0.987	0.895	0.951	0.587
$\Delta$ D	0.358	2.369	2.587	0.002
RESIDS ( $\lambda^{\wedge}$ )	-0.951	0.058	-9.987	0.000

The ECM estimation results show the short-term relationship which exists between the endogeneous variable and the exogeneous ones. Indeed, the estimated ECM adjustment coefficient ( $\lambda^{\wedge} = -0.951$ ) proves to be negative and significantly different from zero at 1% level. Moreover, the obtained results highlight that this adjustment coefficient appears to be statistically and significantly negative, proving the existence of a long-term equilibrium relationship between the households' NPLs and the other variables. In the same way, the coefficient of Tunindex is negative and non-significant in the long run, whereas the foreign currency, deposits appears to bear a positive and significant. Such effects are hard to perceive in the short run, owing to the fact that a long time period is necessary for an eventual complete full shock transmission to take place. Therefore, the deposits and foreign currency appear to have a negative and significant effect in the short term but negative in the long-term estimation. Hence, one can deduce that the rise in the deposits and foreign currency cannot resolve the non-performing loan problem. Therefore, driven by the need to raise the non-performing loan, bank must not only increase its fund, but the optimal resources use. Household anticipations affect short term bank fragility.

Furthermore, the coefficient on credit to economy is positive and statistically significant. These results further confirm the crucial role of bad management and bad investors or borrowers' anticipations in bank failures. In short, one might notice that the in-panel ECM estimation corroborates and confirms the test results achieved by DD (1983). This shows that the model takes into account the anticipation main factors leading to an increase in the bank fragility. Indeed, the model has proved that, in the long run, the increase in the bank fund has to be accompanied with an increase in the bank fragility. This indicates that the increase in bank fragility is more affected by borrowers and investors anticipations than depositors and tourist anticipations. Bad economic environment affects more the bank fragility. In addition, an increase of credit risk affects more and more liquid risk. The customer split is a solution for doubtful accounts: A bank with a diverse portfolio (individuals, local authorities, associations, farmers, SMEs, multinationals ...) should use the customer's segmentation. Before giving credit or engaging in project financing, banks should



carefully analyze the financial situation of their customers. This will ensure their solvency to reduce the amount of bad loans on bank balance sheets. The asymmetry of information between the customer and the bank is still behind this failure. Indeed, companies are looking to improve their image to the bank in order to satisfy their financial needs. The banks cannot be strict with their loyal customers. The bank may find another way to control its customers (credit applicant or applicant) by holding in the capital of customers companies. Indeed, when banks take a part in the customer's companies and are shareholders, they can be aware of their customer's solvency. The Tunisian banks should conduct a stricter policy of covering. Moreover, the Tunisian bank manager should be more professional and vigilant, more careful in the decision to give credit (Central risks, central bank). Similarly, the introduction of prudential regulation, as regards the management of bank liquidity was necessary to save the financial system from excessive risk-taking of a given bank. However, prudential norms fail to reduce liquidity risk. The information asymmetry between the legislator and the manager remained behind the liquidity shortage in Tunisian banks. Recurrence of banking and financial crises can only validate this assertion.

## CONCLUSION

To conclude, the purpose of this paper is to study Household anticipation and the Rise of Financial Fragility in the Tunisian Context. Our database consists of 18 banks the 2005–2015 period. To address potential endogeneity problems, we estimate our models by dynamic panel data.

Firstly, we have applied the unit root test of Im, Pesaran and Shin (IPS, 2003) for dynamic panel data, which eliminates the risk of discovering any fallacious regressions.

Secondly, we have resorted to the error-correction and cointegration tests of Pedroni (2004), which ensure the fact of checking the long-term equilibrium dynamic relationships among the variables in our model.

The detection of a cointegration relationship between the bank fragility indicator and the fundamental variable has provided an undeniably interesting advantage at the practical level. These results confirm the findings of Andrianova et al., (2015b), Lagoarde-Segot & Leoni, (2013). In order to ascertain our results' reliability and robustness, we have primarily opted for the use of the ECM models. The main results have proven that the adjustment coefficients are negative and statistically significant, thus highlighting that the ECM actually confirms and corroborates Pedroni's findings (2004).

Our findings have important implications for banking authorities. They may induce policymakers to reduce the danger in order to preserve the financial system from a

particular bank excessive risk-taking and focus on the interactions between liquidity risk and related systemic risk, as a macro-prudential approach part.

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