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## IMPACT OF BANK ASSET AND LIABILITY MANAGEMENT ON PROFITABILITY: EMPIRICAL INVESTIGATION

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## Abstract

The recent financial crisis has created significant issues for insurers in managing their ALM. Regulatory change towards Solvency and a fair value/realistic approach also leads to greater transparency as regards risk management and the stability of the economic balance sheet. In this context this study examines the factors that are responsible for differences between returns from assets and cost on liabilities experienced by banks in Jordan. This study deals with the impact of Asset and Liability Management (ALM) on the profitability of the fourteen Jordanian Commercial banks from the period 2005 - 2008

The regression used and the results indicate in every year and in all years a highly significant relationship between A/ATA and L/ATA and operating income at 1% and when inter the non-balance sheet variables, the results also show a highly significant relationship between the Herfindahl Index and inflation at 1%.

Finally, the most important component of this structure is the Assets and Liabilities Committee (ALCO) that has the greatest responsibility in building of the general strategy and the supervision of the whole function of assets and liabilities management.

Keywords: Assets and Liabilities Management, optimization, gap, corporate governance

JEL Classification: G15, G32

#### **1. Introduction**

The management of the bank is permanently concerned about the good management of the whole risk profile the organization is exposed to. If the risks (liquidity risk, interest rate risk, foreign exchange risk, credit risk etc.) had been uncorrelated, then they could have been handled separately, by taking appropriate decisions for specific situations, ignoring this way the consequences of the decisions towards the other types of risks. However, there are strong connections, usually cause-effect ones, between all categories of risks.

The main goal of the banking assets and liabilities management (ALM) is the control of the net interest margin. This control can be defensive or aggressive. The purpose of the defensive control is the isolation of net interest margin from the interest rate fluctuations, no matter the course of these variances (positive or negative) for the bank. On the contrary, the aggressive control focuses on maximizing the net interest margin by changing the balance structure of the bank. Both cases analyze the sensitive positions of the bank balance sheet that are sensitive to changes that can appear in the interest rate. The ability to forecast the interest rates represents an important factor, especially within the aggressive control, in ensuring the success of a strategy.

Banks may use a series of available financial instruments to adjust their assets and liabilities. The most frequent method to adapt the short-term assets is the use of money market. In Romania, there are a few financial instruments and banks do not have too many options regarding targeting this strategic issue. Hereby, the available instruments include: interbank placements, purchasing government securities, reverse report transactions with treasury bills. Developed markets provide an extended variety of securities, both public and private, which can be directly transacted or used in different transactions as a support of derivatives.

The structure of liabilities can also be modified on long-term, unlike changing the assets' structure. This implies adapting the strategy according to a series of elements:

- Anticipated structure of assets;
- Interest rates evolution;

• Necessity of ensuring an adequate financing, both from the interest rate risk point of view, as well as liquidity risk.

When the banking institution establishes the risk approach (defensive or aggressive approach), the experience and the risk appetite of management factors are essential. Let's do not forget that the banking assets and liabilities management, with a view to ensuring the maintenance of an appropriate position on international financial markets, is supported by sophisticated financial instruments such as: futures, options and swaps which must be very well-known in details in order to be efficiently used.

In this paper, we develop a general model framework for the ALM of life commercial banks. The remaining sections of the paper are organized as follows: Section 2 presents a review of literature. Section 3 provides the theoretical framework. Section 4 describes data and research methodology. Section 5 reports results of the statistical analyses. Section 6 summarizes the main conclusion and recommendations of the study.

## 2. Literature Review

For more than thirty years, profit testing has been recognized as a major tool available to actuaries involved in product development. Many papers have been written on the use of profit tests in the calculation of gross premiums. The algebra for developing profit profiles is well documented in papers such as Smart (1977), Darbellay/Veraguth (1998) or Koller (2000). A profit test uses projection mathematics to establish the prospective profit profile of a policy on a given set of assumptions. The resulting profit profile is discounted at a risk rate to give the present value of future profits (PVFP). A major strength of profit testing over conventional gross premium formulae is its ability to incorporate the statutory reserving basis independent of the assumed rate of return on one the hand and to use an empirical basis such as event probabilities on the other hand. The profit profile derived from a profit test is the stream of profits, which flow from the policy over its lifetime. Profit or surplus is defined as the excess of income over expenditures during any period, where expenditures include the necessary increase in valuation reserves.

The shape of the profit profile varies greatly from product to product and will depend upon the assumptions incorporated into the profit test. In a life insurance company parts of the profit are distributed to shareholders and/or policyholders, in a pension scheme, however, it could be only distributed to its members as a bonus or used for contribution holidays

Banks' profitability is of utmost concern in modern economy. Banks are in a business to receive deposits or liabilities and to issue debt securities on the one hand and create or invest in assets on the other hand (Fama 1980). Commercial Banks1 incur costs for their liabilities and earn income from their assets. Thus profitability of banks is directly affected by management of their assets and liabilities. In addition, different market and macroeconomic factors also influence the ability of the banks to make profits (Short 1979, Molyneux, and Thornton 1992, Athanasoglou *et al.* 2008). The asset and liability base of banks in developing countries are narrower than their counterparts in developed countries. This study examines how asset and liability management together with external variables such as degree of market concentration and inflation rate impact the profitability of selected commercial banks in Bangladesh. Although impact of the management of banks' asset and liability on their profitability has been studied by a number of researchers (Hester, and Zoellner 1966, Kwast, and Rose 1982, Vasiliou 1996, Kosmidou *et al.* 2004, and Asiri 2007), the issue of banks' profitability in developing countries has received scant attention from the researchers.

A number of authors (Hester, and Zoellner 1966, Kwast, and Rose 1982, Vasiliou 1996, Kosmidou, *et al.* 2004, and Asiri 2007) have studies about the influence of the composition of assets and liabilities on the profitability of bank. Hester and Zoellner (1966) employed statistical cost accounting (SCA) method on US banks and found statistically significant coefficients for most of the categories of assets and liabilities and rejected the null hypothesis that there is no relationship between them. Vasiliou (1996), by employing SCA method, suggest that asset management rather than liability management play more prominent role in explaining inter-bank differences in profitability. However, these findings contrast with the findings of Kosmidou *et al.* (2004) who find that liability management contributes more in creating the profitability differences among the banks. These authors did not incorporate the variables relating to macro economic and market structure in their model. In fact, a number of bank specific or macroeconomic factors such as market structure, Inflation, gross domestic product (GDP) growth rate, etc do impact bank's net earnings which were ignored by these authors. With this view, Kwast and Rose (1982) expanded the traditional SCA model by including market structure and macro economic variables. Nonetheless, their model found no evidence that differential

returns and costs on different categories of assets and liabilities exist between high and low profit banks. In a recent study, Asiri (2007) has applied SCA method and finds that assets are positively and liabilities are negatively related to the profitability of the Kuwaiti banks.

This study is an attempt to close this gap, to bring the issues of banks' assets and liability management in developing countries squarely into focus for assisting better performance of the underperforming banks in these countries. As such, the objective of this study is to complete this gap and to provide suggestions for improving banks' profitability through better asset and liability management in Jordan.

This research makes significant contributions to the literature relating to banks' assets and liability management. This research examines the factors that are responsible for differences between returns from assets and cost on liabilities experienced by banks in a developing country.

## **3.** Theoretical Framework

Zenios, S.A., Ziemba, W.T., 2006, an aggressive management consists of two parts. The first one is anticipating the evolution of the interest rate. The second one consists of adjusting the structure of assets and liabilities that are sensitive to interest rate, in order to maximize the net interest margin. Anticipating an increase of the interest rates leads to taking some measures of quantifying a positive gap of sensitive balance elements, while a decreasing trend leads to a negative gap.

If an increase of interest rates is anticipated, the bank that has a positive gap will register an increase of its revenues. This is the ideal situation. If the institution has a negative gap, it should operate some amendments concerning its portfolio.

Hereby, it could reduce the remaining maturity of placements by selling the assets with prolonged date of payment and fixed interest rate and purchasing liquid assets with short maturity date. Also, it is necessary the stimulation of floating interest credit, to the detriment of that one with fixed interest rate. In parallel, the bank should try to increase the maturity of sensitive resources and to try to get them at the current interest rate (smaller than the future one) that should be unchanged on a longer period. If a decrease on interest rate is anticipated, the bank will act opposite.

The aggressive management has a series of disadvantages that, in case of a failure, could lead to major losses for the bank:

An error within the prevision of interest rates or when an unexpected situation occurs leading to the inversion of their dynamics as an immediate effect could affect the initial objective and cause important losses.

A certain strategy, once implemented, is difficult to be changed, it requires time and further expenses and its immediate consequences are obvious for banking liquidity and affect the whole banking process.

A defensive strategy tries to preserve the current level of net interest margin by protecting it from any change in interest rates. This type of management tries to maintain a balance between the sensitive assets and liabilities for a certain period of time. If this point is reached, an increase of interest rates generates a change of collected and paid interests in the same way, so the net interest margin remains unchanged.

Sinkey, J.F. Jr. (2002), in economic emerging markets environments, as the Romanian one is, we consider that the management of the bank must take a series of specific measures in order to protect the portfolio and its market value. In case of assets it should: decrease of the credit maturity and of the investment portfolio:

Adjustment of active interest rates to real positive levels;

• Usage with priority of variable interest rates;

• Disburse credits with priority for clients who have export activity, that cash in convertible currencies, that register a consolidated demand in real terms, that prove a competition advantage in comparison to other industries or to other competitors, that prove price adjustment ability;

• Apply of index interest rates for compensating the inflation erosion of investments value;

• Increase the number of credit and investment portfolios reviews to identify the possible problems. and then lent resources) according to the credit maturity and the level of risk;

• Maintaining a liquid assets stock, for permanent maintenance of adequate liquidity, which is necessary for the reimbursement of borrowed deposits;

• Active usage of interbank market facilities on short term (O/N – overnight) to invest the excess of liquidity and to assure the resources for financing;

• Ensuring an appropriate safety liquidity level (back-up liquidity);

Diversification of borrowed resources;

• Providing access to further credit resources, such as credit lines ensured by other banks or even by Central Bank.

## 4. Data and Methodology

The empirical investigation on the Impact of Bank Asset and Liability Management on Profitability sampled of commercial banks. All banks that have been listed on the Amman Stock Exchange (ASE) during the four-year period, 2005–2008, The data for the empirical analysis were derived from the financial statements of these firms.

Statistical Cost Accounting (SCA) model is described by Hester and Zoellner (1966) as a regression method by which 'rates of return are imputed to earning assets and deposit liabilities' (p. 373). The current study adopts the SCA model with some modification proposed by Kwast and Rose (1982). This research endeavors, for the first time, to apply this model in modified form to examine the impact on ALM on the profitability of the commercial banks in Jordan.

A bank earns revenue from many sources and prominent of these are interest income, service fees and commissions from its assets and income from using liabilities. On the other hand, costs of banks are also sourced from bank's assets and liabilities. These expenses include interest expenses on deposits, other liabilities and administrative expenses. Now, if we subtract operating costs from operating revenues we will get net operating income for the banks.

Thus variations in banks' net operating income, Ybt can be expressed for bank b and time t in terms of variations of assets and liabilities in the following way:

$$Ybt = \alpha I + \Sigma \alpha 2iAibt + \Sigma \alpha 3jLjbt + ebt$$
<sup>(1)</sup>

Where,

A*i* = ith asset;  $L_j$  = jth liability;  $\alpha I$  = net fixed income that is not dependent on assets and liabilities; elt = stochastic term;  $\alpha 2i$  = marginal rates of return on assets; a3j = marginal costs of liabilities.

As banks have wide variations in their business volume, all the variables of equation (1) are divided by a bank's average total asset (TAbt) (Kosmidou *et al.* 2004). Thus equation (1) takes the form of:

$$Ybt/Abt = \alpha 1/TAbt + \Sigma \alpha 2iAibt/TAbt + \Sigma \alpha 3jLjbt /TAbt + ubt$$
<sup>(2)</sup>

Where, the stochastic term ubt = ebt / TAbt

The structure of the traditional SCA model implies that all banks experience identical interest rates on bank's assets and liabilities. In reality, a number of factors may affect bank's earning and costs relating to assets and liabilities. These factors are market structure and macroeconomic conditions. If these factors are not included in the model, regression results will be unreliable and coefficients will be biased. Kwast and Rose (1982) incorporated the influences of these factors and presented a modified model as equation 3. This modified model is adopted to study, for the first time, selected commercial banks in Bangladesh.

$$Ybt/Abt = \alpha 1/TAbt + 2\alpha 2iAibt/TAbt + 2\alpha 3jLjbt /TAbt + 2\alpha 4Ht + 2\alpha 5fMft + ubt$$
(3)

Where,

H = Herfindahl Index of market concentration associated with each bank; M = Inflation as a binary variable for number of years.

The Herfindahl Index is the sum of the squared market shares of the firms in the market. Pasiouras and Kosimidou (2007) found a direct relationship between market concentration and firm profitability. Thus, the inclusion of H in the model helps to assess the influence of local market concentration on bank earnings

Oguzsoy and Guven (1997) found that banks' profitability is adversely affected by inflationary situation which make banks vulnerable to default risk, interest rate risk and liability risk. Due to onslaught of so many risks, bank may face a huge amount of loss in a variable inflationary environment. Since inflation is one of the most important macroeconomic variable that impact bank's profitability, it is included in the model as a binary variable (M) in equation (3).

The explanatory variables used in our analysis are described in Table 1. The model Equation (5) is used to estimate different rates of return on the following main four assets and four main liabilities of the balance sheet of the commercial banks in Jordan .

Variables	Description
Assets	Assets
A1	Loan
A2	Bill discounted and purchased
A3	Deposit with other banks
A4	Government security
Liabilities	Liabilities
L1	Fixed/time deposits
L2	Saving deposits
L3	Current and other non-interest bearing
	liabilities
L4	Other borrowings and funding

## Table 1. Explanatory variables relating to BCB's assets and liabilities

In addition, the following explanatory variables are also included in the model to improve the reliability of the results.

#### Table 2. Non-Balance Sheet variables

Market Structure Variable			
Н	Herfindahl Index of		
	Market Concentration on each Bank		
Macroeconomic Variables			
M	Inflation Rate		

## 5. Empirical Results and Discussion

Table 3-4-5 shows the results of regressions that use OPINC as the dependent variable for commercial banks. It is evident from Table 3 that all of the assets and liabilities have significant contribution to total income. The coefficients of all the liabilities are significant at 1% level. The coefficients of assets and liabilities are positive and significant as expected.

Market concentration variable (H) impacts positively the total income commercial banks. The impact of inflation rate is positive indicating that these commercial banks increase prices as a consequence of inflation.

The results indicate in year 2005, 2006, 2007, 2008 and in all years a highly significant relationship between A/ATA and L/ATA and operating income at 1% (sig .000 F-test 208.790) and when inter the non-balance sheet variables, the results also show a highly significant relationship between the Herfindahl Index and inflation at 1% (sig .000 F-test 191.086)and when take all independent variables on balance and non-balance sheet, the results show a also highly significant relationship at 1% (sig .000 F-test 95.731).

The results suggests that all the assets have significant and positive impact on net operating income, The coefficients of three liabilities (L1, L2, L3 and L4) are significant at 5% level the

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coefficient of saving deposits (L2) is positive and it may be argued that these banks pay only nominal interest on this deposit but charge high service fees. All assets are significant and have positive coefficients as expected .The coefficients of market concentration (H) and inflation rate (M) are found to be significant for operating income of commercial banks in this regression analysis .The positive coefficient of H reconfirms the favorable impact of market concentration on profitability of commercial banks.

These results confirm the importance of the frequency of ALCO meetings is very important in achieving of the established purposes. Without trying to offer a solution, the specificity of the financial markets and of the bank activity seldom impose more often meetings and adopting new strategic decisions. Hereby, a banking institution that has a stable level of the balance sheet and a well defined mix of products, without a market maker activity in derivatives field or with a reduced portfolio of transacted securities, can be managed by annual or quarterly ALCO meetings. As far as the market is more volatile and the activities of the bank are more exposed to risks, meetings should take place.

It is important that we are using realistically reflects all material interactions between assets and liabilities as well as the impact of the actions of policyholders and the management of the insurer which could impact operational ALM. This becomes especially important under extreme market conditions which drive economic capital calculations. Such interactions should be considered under all scenarios.

We must consider the impact and interaction of the following:

- 1. Market and other external conditions;
- **2.** Actions by policyholders;
- **3.** Actions by management.

Certain movements in (1) can cause certain actions by management and/or policyholders, but the actions of management and policyholders can also be dependent on one another.

## 5.1 Market and Other External Conditions

A model will consider a range of different economic and other external assumptions. This could typically be via a set of stochastic scenarios, or by individual shock scenarios, possibly combined with a set of stochastic scenarios under each shock. Such assumptions could reflect the level and shape of interest rates, market values and returns on equities and other real assets, credit spreads, defaults and downgrades of corporate bonds, inflation etc

It is important that our set of economic scenarios is internally consistent. For instance in a scenario in which equities fall in value we might also expect to see increased corporate bond defaults and downgrades. It is also possible that other assumptions could be correlated to economic conditions, such as the level of expenses.

## 5.2 Actions by policyholders

Dynamic policyholder behavior arises particularly when an option to a policyholder becomes more or less valuable depending upon economic or other external conditions. For instance, a surrender value capital guarantee can become more valuable at a time of depressed market values of assets.

- Other policyholder options can include:
- Take-up of guaranteed annuity options (GAOs);
- Extending the original term of the policy on guaranteed terms;
- Take-up of various benefits or fund switches under Variable Annuity products.

The assumptions we make about how policyholders may react will depend upon the extent to which we believe they will behave in an economically rational way. Clearly the actions of policyholders will have an impact on financial results and on the investment strategy.

Another policyholder action which needs to be considered is the level of future new business written. This will have an impact on financial results and the ALM position of, say, a segregated fund where new business is pooled together with existing policies and shares in investment returns. One approach could be to model dynamic volumes of future new business which depend on policyholder returns projected on policies. A simpler approach is to give a weighting to policyholder returns when considering the optimum investment strategy, as described in Section 2 above. Generally we consider

policyholder behavior to be unchangeable in the sense that it is not possible to find hedges against uncertainties in the level of policyholder behavior.

## 5.3 Actions by management

Management will have discretion in certain areas, which may include:

**a.** Investment strategies. This would include deciding which assets to buy and sell in different scenarios and could depend on, for example, cash-flow requirements, the requirement to cover policyholder guarantees and the level of unrealized gains/losses in the fund;

**b.** Discretionary bonus rates or profit sharing. In some countries bonus rates are prescribed by formulae, but a degree of control could be available, for instance by controlling the rate of realization of gains and losses;

**c.** Application of a Market Value Adjustment (MVA) where the insurer has the right to adjust the policy value paid on early surrender when the market value of assets has fallen;

d. Control of the level, type and destination of new business written.

For instance, writing new business in a particular segregated (pooled) fund could improve or worsen the ALM position of that fund, so management could decide to write new business in an existing fund, or open a new fund depending on conditions. Writing new business in a fund could, for instance, avoid having to sell assets to pay claims as new premiums bring a positive cash-flow to the fund

Table 3. Regression Analysis of Impact of Bank Asset and Liability Management on Profitability (2005)

	Dependent Variable : Net Operating Income ( OPINC)				
year	Index	A/ATA + L/ATA	Herfindahl Index+ INF	A/ATA + L/ATA+ Herfindahl Index+ INF	
2005	R	.972	.970	.972	
	R^2	.946	.941	.946	
	Adj- R^2	.941	.936	.936	
	SIG	.000***	.000***	.000***	
	F- test	208.790	191.086	95.731	

Significant at p <0.10 \*\* Significant at p< 0.05 \*\*\* Significant at p< 0.01

Table 4. Regression Analysis of Impact of Bank Asset and Liability Management on Profitability (2006)

Dependent Variable : Net Operating Income ( OPINC)				
year	Index	A/ATA	Herfindahl Index+ INF	A/ATA
		+ L/ATA		+ L/ATA+ Herfindahl
				Index+ INF
2006	R	.980	.981	.981
	R^2	.960	.962	.963
	Adj- R^2	.953	.959	.952
	SIG	.000***	.000***	.000***
	F- test	133.554	304.271	87.382

Significant at p <0.10 \*\* Significant at p< 0.05 \*\*\* Significant at p< 0.01

Table 5. Regression Analysis of Impact of Bank Asset and Liability Management on Profitability (2007)

	Dependent Variable : Net Operating Income ( OPINC)				
year	Index	A/ATA + L/ATA	Herfindahl Index+ INF	A/ATA + L/ATA+ Herfindahl Index+ INF	
2007	R	.988	.977	.987	
	R^2	.975	.955	.975	
	Adj- R^2	.971	.951	.970	
	SIG	.000***	.000***	.000***	
	F- test	215.949	255.707	213.478	

Significant at p <0.10 \*\* Significant at p< 0.05 \*\*\* Significant at p< 0.01

Dependent Variable : Net Operating Income ( OPINC)					
year	Index	A/ATA Herfindahl Index+ A/ATA			
		+ L/ATA	INF	+ L/ATA+ Herfindahl	
				Index+ INF	
2008	R	.947	.948	.948	
	R^2	.896	.898	.898	
	Adj- R^2	.877	.890	.880	
	SIG	.000***	.000***	.000***	
	F- test	47.381	105.677	48.609	

Table 6. Regression Analysis of Impact of Bank Asset and Liability Management on Profitability (2008)

Significant at p <0.10 \*\* Significant at p< 0.05 \*\*\* Significant at p< 0.01

Table 7. Regression Analysis of Impact of Bank Asset and Liability Management on Profitability (2005-2008)

	Dependent Variable : Net Operating Income ( OPINC)				
year	Index	A/ATA	Herfindahl Index+ A/ATA		
		+ L/ATA	INF	+ L/ATA+ Herfindahl	
				Index+ INF	
2005-	R	.931	.920	.936	
2008	R^2	.866	.846	.876	
	Adj- R^2	.861	.840	.867	
	SIG	.000***	.000***	.000***	
	F- test	171.640	145.46	90.297	

Significant at p <0.10 \*\* Significant at p< 0.05 \*\*\* Significant at p< 0.01

#### 6. Conclusion and Recommendations

New regulations and a stronger competition have increased the importance of stochastic assetliability management (ALM) models for insurance companies in recent years .This is an empirical study on the asset and liability management of Jordanian 14 commercial banks for the period 2005-2008.

It is critical that the hedging A/L manager understand first and foremost how vulnerable the bank's balance sheet and bottom line are to changes in the value of the hedge and the relationship between the hedge and the asset or liability being protected. A scenario analysis should be performed, using the market conditions associated with the worst case scenario as the inputs to the model being used, to evaluate the effect of the hedge on the underlying asset or liability. The responsibility of using derivatives products effectively and prudently ultimately rests with the A/L managers and the bank A/L management committee (ALCO) executives who monitor their performance.

The recent financial crisis has created significant issues for insurers in managing their ALM. Regulatory change towards Solvency and a fair value/realistic approach also leads to greater transparency as regards risk management and the stability of the economic balance sheet. In this context it seems timely to discuss what advances can be made in the area of Dynamic Asset Liability Management

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# FEED-BACK TRADING BEHAVIOR OF FOREIGN INSTITUTIONAL INVESTORS AND LOCAL MUTUAL FUNDS IN INDIAN STOCK MARKET: AN EMPIRICAL EVIDENCE

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#### Abstract:

This paper makes an effort to investigate the presence of feedback trading behavior, if any with reference to foreign institutional investors (FIIs) and mutual fund investments in relation with the benchmark market index CNX SandP Nifty. The study used the daily data for the period started from April  $1^{st}$ , 2001 to December  $31^{st}$ , 2009 and applied various econometric models to identify the investment behavior of various institutional investors. The study concluded that the FII's are engaged in the positive feedback trading activities and inducing volatility in Indian stock market, whereas the local mutual funds are found to be involved in negative feedback trading in Indian stock market, which provide support to the market when it becomes volatile.

Keywords: feed-back trading, institutional investors, foreign portfolio investment, causality

JEL Classification: G11, G23, C32

## 1. Introduction

Efficiency of the capital markets is one of the core issues, which attracts the attention of researchers from all over the world. The market efficiency is a qualitative phenomenon in determining whether the stock prices correctly reflect the fundamental prices of the stocks or not. So it is considered as a function of price discovery process pursued by different category of the rational investors. In the price discovery process, the stock price moves with the information flow and the direction and magnitude of price change depends upon how the information is perceived by the majority of investors. The price of the stocks at a particular moment of time indicates the expectations or the response of the majority of the investors to the new information available.

One of the assumptions of efficient capital market is that the investors are rational who believe in the fundamental value of the stocks and this fundamental or intrinsic value may change with any news or information, which comes into the market. There is another category of investors who are continuously looking for certain patterns or trends in the stock returns and expect that this pattern will continue for some time in the future and they invest accordingly. In simple words, the investment behavior of these investors is influenced by the prevailing patterns of the stock returns in the equity market. In the area of behavioral finance, these investors are known as feedback traders. The feedback trading behavior of these investors is the main cause of volatility in the stock returns. There are two types of feedback trading behavior in the stock market: positive feedback trading behavior, and negative feedback trading behavior.

The positive feedback traders identify the ongoing trend and assume that this trend will persist and hence start following it. When other well informed investors (information leaders) are investing in the stock market and as a result the stock prices rise, these feedback traders follow the market trends and start investing in the stock market with the expectation that the rising trend will persist. As a result the prices of the stocks continue to increase and reach a level that is at the excess of their fundamental valuations and hence volatility in the market increases. In the reverse direction, when the wellinformed investors starts selling the stocks in the market, these feedback traders expect the market to decline further in the future and thereof start selling the stocks in the market. The market prices of the stocks at this time come down to such an extent that their prices are even less than the prices based on the fundamentals. In both the cases the volatility in the market increases and persists for a long time. The positive feedback traders thus become one of the causes of instability in the market. On the other hand the second category is of negative feedback traders, who behave in the opposite manner. They buy the stock when the market goes down and sell when the market goes up, thus provide stability to the market.

The well-informed investors and the feedback traders have their own specific roles in the stock market. The presence of both categories of investors with their specific roles provides the theoretical explanation of the serially correlated stock returns and the volatility patterns of the same. If the autocorrelations of index return of the stock market are analyzed, two kinds of patterns can be identified: persistence of positive correlations and frequent reversals of correlations. When the volatility is low and having a positive correlation with the index returns and it turns negative when volatility become high, then this increase in volatility or reversals of positive serial correlations indicates the presence of positive feedback traders in the market. Positive feedback trading activities in the market can be the result of many different trading strategies such as, trading on the basis of extrapolative expectations, using stop-loss orders or engaging in certain types of portfolio insurance. Such behavior causes volatility in the market as the investors buy overpriced securities and sell underpriced securities, thus moving prices away from fundamentals. Feedback traders can stabilize or destabilize a market according to their feedback trading behavior, thus it become import to chase the behavior of various investors in the Indian stock market. Amihud, and Mandelson (1994), Warther (1995), Froot et al. (2001), Pasricha, and Singh (2001), Mukherjee, and Paramita (2002), Badhani (2005), Bhattacharya, and Jaydeep (2005), Karmakar (2006), Porwal, and Gupta (2006), and Garg, and Chhabra (2010) indicate that the foreign institutional investors (FIIs) affect the return of Indian stock market. So the study attempted to find out the trading behaviour of not only FIIs but local mutual funds as well as they explain the major part of stock market movement.

## 2. Literature Review

A large number of research papers are available on the evidence of positive feedback trading (i.e. selling during market declines and buying during market advances) in India and abroad. The summaries of some of the previous researches are given as follows:

Sentana and Wadhwani (1992), investigated the presence of positive feedback trading in the US stock market and found the presence of positive feedback traders in the US market. Bahmani-Oskooee and Sohrabian (1994), were among the first to use co integration and Granger causality to explain the direction of movement between exchange rates and stock prices in India and found foreign institutional investors use positive feedback trading strategies. Wermers (1999), studied the trading activity of the mutual fund industry between 1975 and 1994 and found little herding in the average stock, much higher levels in trades of small stocks and in trading by growth-oriented funds. Gregory and Reza (2001), found presence of positive feedback trading activity in emerging capital markets but mostly during market declines.

Chakrabarti (2001), has perceived a regime shift in the determinants of FII following the Asian financial crisis. He used the data of BSE for a period of 6 years from May 1993 to Dec. 1999. By applying the Granger Causality Test on the data, he found that in the pre-Asian crisis period, any change in FII had a positive impact on equity returns, but found a reverse relationship in post Asian crisis period. The study pointed out that the change in FII is mainly due to change in equity returns. Mukherjee, Bose, and Coondoo (2002), Batra (2003), Rao, and Bhanumurthy (2005), Pal (2005), and Panda (2005) also confers the results of Chakrabarti regarding the relation of FIIs and Indian stock market return found in post liberalization period and support the positive feedback trading hypothesis.

Demier and Kutan (2005), found evidence of herding behavior in the Shanghai and Shenzhen A-share markets that are dominated by domestic individual investors and also B-share markets within both, in which FIIs are the main participants. Herding occurs in both rising and falling market conditions. Anthony (2005), analyzed a new data set for the aggregate daily trading of all foreign investors in six Asian emerging equity markets and found foreigners' flows into several markets show positive feedback trading and the price impacts associated with foreigners' trading are much larger than earlier estimates.

Martin and Stefan (2006), showed that positive feedback traders are present in Germany's Neuer Markt and induce negative return autocorrelation during periods of high volatility. Zhou and Lai (2007), reported a persistent and significant smaller herding in property stocks in the Hong Kong stock market. Alemanni and Ornelas (2007), analyzed empirically the behavior of foreign investors on emerging equity markets in a cross-country setting, including 14 emerging markets from the year 2000

to 2005. They found little evidence that these investors have brought problems to local emerging markets. Regarding feedback trading, they supported two hypotheses: positive feedback trading by hedged investors and negative feedback trading by unhedged investors.

Edelen and Warner (2008), studied the relation between market returns and unexpected aggregate flow into US equity funds, using semi-weekly and daily flow data. They found that the flow-return relation is mainly concurrent, but flow also follows returns with a one-day lag. The lagged response of flow indicates the presence of positive feedback trading.

Shu, Tao (2008), investigated the impact of positive feedback trading by institutions on stock return momentum and market efficiency in US market. Using an ex-ante measure of positive-feedback trading by institutions, he found that return momentum is stronger in stocks that attract more positive feedback trading by institutions, suggesting that positive feedback trading by institutions intensifies stock return momentum.

Kim and Wei (2009), used a unique data set and studied the trading behavior of foreign portfolio investors in Korea before and during the currency crisis. They found that investors in different categories have different trading patterns. Foreign investors outside Korea are more likely to engage in positive feedback trading strategies and are more likely to engage in herding than the branches/subsidiaries of foreign institutions in Korea or foreign individuals living in Korea. This difference in trading behavior is possibly related to the difference in their information.

Zau and Cao (2009), investigated the impact of individual and institutional investors trading strategies on Chinese market and found individual investors flow positive feedback trading pattern and institutional investors flow the instructions of experts. And both of the categories have significant bearing on stock market returns.

However a number of studies have been conducted on the topic in India and abroad but present study is an attempt to improve in the following terms: first, it is a comprehensive study, as it has analyzed trading behavior of both foreign institutional investors and local mutual funds. But almost reviewed studies emphasized only on the trading behavior of foreign institutional investors in domestic markets. Secondly, the time frame used for the present study is comparatively wide (from April 1<sup>st</sup>, 2001 to December 31<sup>st</sup>, 2009. Lastly, advance econometric models such as Granger causality test, VAR model, Wald Test and Impulse Response Function have been applied. The present study has been divided into five sections. First section gives introduction, and the second section provides review of previous studies. The third section describes the data and methodology used to investigate the investment pattern of institutional investors. While the fourth section contains the results of the study, the final section gives the conclusions and policy implications.

## 3. Research Methodology

This paper is an attempt to find out the presence of feedback traders in the Indian stock market and its impact on the volatility of the stock returns. For such kind of study descriptive research design is suitable.

## 3.1. Hypothesis

The objective of the study can be achieved using the following hypothesis:

Ho1: There is no existence of feedback trading in Indian stock market

Ho2: There are no significant autocorrelations in the indices returns.

Ho3: There is no causal relation between the Nifty returns and foreign institutional investor's investment behavior.

Ho4: There is no causal relation between the Nifty returns and mutual fund investment behavior.

Ho5: There is no causal relation between foreign institutional investors and mutual fund's investment behavior.

#### **3.2. Data Descriptions**

The daily equity investment by foreign institutional investor's (FII) and mutual funds in Indian stock market as well as the daily returns of S and P CNX Nifty as benchmark market index is chosen for the study. The daily data of gross equity buying and gross equity selling by both the categories is available. In spite of considering the net equity investment of the foreign institutional investors and mutual funds, the ratio of their daily gross equity buying to daily gross equity selling is considered for

the analysis. This is done to remove the non-stationarity in the net investment time series data and the mathematical difficulty of calculating returns of negative values. In case of the market index, the natural log returns are calculated by using following formulae:

$$r_{i,t} = \ln (P_{i,t} / P_{i,-1})$$

Where  $r_{i,t}$  represents the current day return,  $P_{i,t}$  stands for current day adjusted closing price of the index and  $P_{i-1}$  previous day adjusted closing index.

The sample period considered for the study is April 1<sup>st</sup>, 2001 to December 31<sup>st</sup>, 2009 The data is secondary in nature and collected from the website of national stock exchange, CMIE database PROWESS, and the website <u>www.moneycontrol.com</u>.

## 3.3. Statistical and Econometric Tools

Analysis of the daily data has been done using the statistical and econometric tools such as Serial correlation test, ADF unit root test, Granger's causality test, Vector Auto Regression (VAR) estimate, Impulse Response Function and Variance Decomposition Analysis. For that purpose, Microsoft excel, SPSS and Eviews have been used.

#### 4. Analysis and Results

## 4.1. Correlation Analysis

To find out the patterns in the behavior of institutional investors investment and Nifty returns auto correlation of all the three variables (Stock market return, FIIs' investment ratio and mutual fund investments' ratio) have been checked with the help of autocorrelation graphs. The correlograms pertaining to the patterns of Nifty return and investment ratio of foreign institutional investors and local mutual funds are given in Figure 1. The graphs depict the existence of autocorrelation in the behavior of all the three series upto the lag of four to five days. The graphs pertaining to FIIs and Mutual funds investment indicates the presence of feedback trading in the Indian stock market. As a result of the feedback trading behaviour of the institutional investors, the Indian stock market return also moves in specific patterns. To verify the above said relation among the same, Karl Pearson correlation coefficients have also been calculated. The results of the test has been presented in Table 1.



#### NIFTY Daily Return



Figure 1. Partial Auto Correlation Function of CNX SandP Nifty Return, FIIs And Mutal Funds Investment Ratio

	Karl Pearson's Coefficient of Correlation (r)	Significance Value (Two Tailed)	Remarks
Nifty Returns and Mutual Funds	0.107	.0000	Significant
Nifty Returns and FIIs	0.064	.0020	Significant
FIIs and Mutual Funds	-0.049	.0160	Significant

Source: Calculated with the help of SPSS.

Table 1 presents that Nifty returns is significantly correlated with both FIIs and local mutual funds investment ratios and the correlation in both of the cases is positive. Where as, the investment ratios of local mutual funds are negatively correlated with FIIs investment ratios.

## 4.2. Unit Root Test

It is a well-known fact that many financial time series are random walk or non-stationary time series and contains unit root. Test of unit root in the time series is necessary for the purpose of modeling of relationships, if any among the series. Presence of non-stationarity may give invalid inferences in the analysis. Augmented Dickey-Fuller (ADF) test is the popular test for unit root testing of time series. If  $Y_t$  is the time series to be tested for unit-root, then the test statistic for ADF unit root

testing will be given by  $\tau$  statistics, which is OLS estimate of coefficient of  $Y_{t-1}$  in Equation (1), divided by its standard error:

$$\Delta y_t = \rho y_{t-1} + \mu + \lambda_t + \alpha_i \sum_{i=1}^n y_{t-i} + u_t$$
 Eq.(1)

The results of ADF unit root test have been reported in the Table 2. Results indicates that all the three variables are stationary at level as their ADF test statistics are more than the critical values. As all the three variables are stationary at same level thus, they are also integrated at zero order.

#### Table 2. Results of ADF Unit Root Test

Variable	ADF Statistics with Intercept	ADF Statistics with
		Intercept and Trend
Nifty Returns	35.7590	35.7828
FIIs Investment Ratio	23.5714	2412.05
Mutual Funds Investment Ratio	20.6174	20.6181
Critical Values		
1 per cent	3.4382	3.961787
5 per cent	2.8625	3.411641
10 per cent	2.5673	3.127693
Note: H <sub>0</sub> : Variable is having unit root.		

#### 4.2. Pair-wise Granger Causality Test

The Granger's causality test has been used for analysing the lead lag relationship between the time series data. It has used to determine causal relationship amongst the dependent and independent variables under reference. Granger Causality Test is a bi-variate analysis and involves estimates  $X(Y \rightarrow X)$  and  $Y(X \rightarrow Y)$  by using following pair of regressions:

In the above equations  $Y_t$ ,  $X_t$  are the variables to be tested and  $\alpha_i$ ,  $\beta_i$ ,  $\lambda_i$ ,  $\delta_i$  are coefficients explaining the relation of dependent variable with the lag terms of independent variable and lag terms of dependent variable in itself.  $\varepsilon_{1t}$ ,  $\varepsilon_{2t}$  are mutually uncorrelated white noise errors. t is the time period and i is the number of lags. The null hypothesis is  $\alpha_{i,=} = \delta_I = 0$ . If the  $\alpha_i$  is statistically significant but  $\delta_I$ is not then it means X causes Y, in the reverse case Y causes X. But if both are significant then causality runs both ways. The results of the test have been reported in Table 2. Results of the Granger's causality test indicate that there exist a bi-directional causal relation between the CNX Nifty daily returns and FIIs and local mutual fund investments. The daily returns of Nifty as a benchmark index provide the sentiments to the market players, which may influence their investment behavior. That is, the mutual funds as well as FII's chase the market returns and are involved in the feedback trading activities. However, FIIs and mutual funds investment affect the stock market return but they are not influenced by each other as null hypothesis of no causal relation between FIIs and local mutual funds is accepted in both the cases.

Table 2.	Results	of Pair-Wise	Granger	Causality	Test

Null Hypothesis	F- Statistics	P-Value
Nifty returns does not Granger Cause MF investment	34.72	0.0000*
Nifty returns does not Granger Cause FII investment	42.82	0.0000*
MF investment does not Granger Cause Nifty returns	5.906	0.0020*
MF Investment does not Granger Cause FII Investment	1.336	0.2630
FII investment does not Granger Cause Nifty returns	3.004	0.0480*
FII investment does not Granger Cause MF investment	0.699	0.4970
Note: * Significant at 5 per cent level.		

## 4.4. Vector Auto Regression Estimates

VAR methodology considers several endogenous variables together where each endogenous variable is explained by its lagged values and the lagged values of all other endogenous variables in the model; usually, there are no exogenous variables in the model. Here, we have three endogenous variables (Mutual funds investment ratio, FII investment ratio and Nifty daily returns) and no exogenous variable.

The pair wise Granger's causality test (as shown in Table 2) provides the causal relation between the two variables at a time, whereas the VAR model considers many variables at a time. If one variable 'Granger causes' other variable the coefficients of the lagged values of the former must be significant in VAR. But as a VAR includes many lags of variables, it is difficult to establish which set of variables have significant effect on each dependent variable and which do not. In order to address this issue, VAR Granger Causality or the Block exogeneity Wald test are usually conducted that restrict all of the lags of a particular variable to zero. The VAR Grangers causality or the Block exogeneity Wald test summary is shown in Table 3.

Table 3. Var Granger Causality/Block Exogeneity Wald Tests (Order of theVAR=2)

Null Hypothesis	$\chi^2$ Statistic	P-Value
Nifty returns does not Granger Cause MF investment	68.34	0.000*
Nifty returns does not Granger Cause FII investment	87.11	0.000*
MF investment does not Granger Cause Nifty returns	13.16	0.001*
MF Investment does not Granger Cause FII Investment	4.16	0.124
FII investment does not Granger Cause Nifty returns	7.35	0.025*
FII investment does not Granger Cause MF investment	0.38	0.827
Note: * Significant at 5 per cent level.		

Results of the Wald Test confirm the results of Granger Causality test. As, daily returns of Nifty influence both the investment behavior of mutual funds as well as FII's. Also the mutual funds investment influences the daily returns of Nifty. There is no causal relation between the investment activities of the mutual fund and FII's.

## 4.5. Impulse Response Function

The impulse response traces the responsiveness of the dependent variable in the VAR to shocks to each of the endogenous variables. So, for each variable from each equation of the VAR separately, a unit shock is applied to the error, and the effects upon the VAR system over time are noted. The ordering of the endogenous variables may affect the results of impulse response; hence the generalized impulses are considered for the analysis in order to neutralize the ordering effect. Figure 2 represents the pair wise impulse response relations among the mutual funds investment behavior, Foreign Institutional Investor's investment behavior and the daily returns of the Index Nifty.

The above figure show that the investment activities of the mutual funds as well as of the FII's are influences by the daily returns of Nifty. It is clear from the figure that there is a positive response of the FII's to the daily returns of Nifty whereas the mutual funds responses are in opposite direction. It can be concluded from the results that FII's are involved in positive feedback trading whereas the mutual funds are involved in the negative feedback trading. The investment behavior of FII's increases the volatility in the daily returns of the index whereas the mutual funds provide the stability to it. The impulse responses also indicate persistence in the investment behavior of mutual funds and foreign institutional investor's up to the lag of four days. The daily returns of the index is seems to be influenced by the investment activities of FII's but not by the investment activities of Mutual funds. Also the mutual funds are the main sellers when foreign institutional investor's are the buyers and vice versa.



Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 2. Impulse Response Function

## 4.6. Variance Decomposition Analysis

The Variance decompositions offer a slightly different method for examining VAR system dynamics. They give the proportion of the movements in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables. The results of the variance decomposition analysis for the period of 10 days is given in Table 4. The results indicate that 0.59 per cent of patterns of daily returns of Nifty is explained by FII's investment activities. While, investment activities of mutual

Variable	Percentag	Percentage of the Variance Explained by:		
	Returns	MF	FII	
Returns	98.06	1.34	0.59	
MF	3.53	96.39	0.07	
FII	3.89	0.07	96.04	

Table 4. Results of Variance Decomposition Analysis

Funds has explained 3.53 per cent of daily returns of index. It means local mutual funds are having stronger impact on the Nifty return as compare to impact of FIIs. One important point to be notices here that when impact of Nifty return has examined on both. The study found that return affects FIIs more than the local mutual funds as it explains 3.89 per cent of FIIs activities while in case of local mutual fund the explaining power of return is 3.53 per cent.

#### 5. Conclusions

Different category of investors' such as well-informed investors, risk averse investors and aggressive investors are trading in the stock market with their specific investment behavior. The investment pattern of few well informed rational investors is supposed to provide the sentiments to the stock returns in the stock market, which will further be followed by the feedback traders with the expectation that the trend will persist. The analysis done in the paper is concluded with the results that in Indian stock market the patterns of daily returns of Nifty influence the investment behavior of both the mutual funds and FII's activities. The FII's are engaged in the positive feedback trading activities whereas the local mutual funds investor who are assumed to be more informed about the domestic market environment as compared to the FIIs, are found to be involved in negative feedback trading in Indian stock market. The daily return of the index is also influenced by the mutual funds activities and not by the FII's investment activities. This indicates the growing strength of the Indian mutual fund industry.

It can be interpreted by the analysis that chasing of the patterns or trends in the stock returns by FII's moves the stock prices away from their fundamental values and as a result increases the volatility in the daily returns of the index; whereas the local mutual funds being involved in negative feedback trading provides stability to the stock returns. On the basis of the above results, regulatory authorities are advised to make strict norms for the FIIs so that volatility induced by them in the share market can be curbed. As local mutual funds found to provide more strength to Indian stock market, they should be supported by the regulators. Individual investors are advised to chase the pattern of Indian mutual funds as they bring stability in the system and also affecting the pattern of Indian stock market.

The limitation of the study is the unavailability of the intraday investment data of foreign institutional investors and mutual fund investment. The daily investment data of other category of investors such as high net worth individuals and retail investors are not available in India. Despite all these limitations the study assumed that the chosen data is suitable enough to achieve the objectives of the study.

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# FORECASTING PUBLIC ADMINISTRATION WAGE DYNAMICS. AN APPLICATION TO THE ITALIAN NATIONAL HEALTH SERVICE

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#### Abstract

This paper shows a methodological approach and applicative potential of a forecast model of public administration labor cost. The econometric model affords a tool for analysis and forecasting for the dynamics shaping the future evolution of compensation of employees in Public Administration, at a highly disaggregated level. Applied to the National Health Service (NHS), the model captures the change in shape of distribution and identifies the causes of wage dynamics arising from decentralized wage bargaining, personnel seniority, promotions and professional qualifications changes: a share effect, based on the personnel qualifications structure (weighed with a given average national wage); a shift effect, based on average wages dynamic (weighed with observation-specific personnel qualifications structure). Thanks to the use of simple relationships, the model is designed for maximum flexibility in use and it is an efficient tool for applications and analyses at the political-institutional level. Description of the results of applications reveals some of the model's analysis potentialities, making particular reference to the ability to control wage dynamics.

Keywords: distributional analysis, public administration, wage distribution dynamics

JEL Classification: C14, C50, H83

#### 1. Introduction

In modern industrialized economies public sector has always been the largest industry for both number of employees and added value (in the year 2007 about 11% of the gross domestic product). This industry is based on the output of goods and services and the element characterizing it is that such process takes place in several structures and peripheral organizations within the territory. This organizational characteristic, which is stressed for National Health Service (NHS), has recently made the public administration rethink its forecasting techniques for the many public finance variables and opt for disaggregated prototype models that consider the organizational structure of the Public Administration (MEF 2006). For public administration labor cost the matter is even more delicate. The institutional approach does not consider the effects due to the heterogeneous structure of government expenditure, thus producing erroneous forecasts affected by aggregation errors (Di Dio 2007). In the institutional approach, the forecast does not present any analysis of the structure of the data that is iterative and in function of the last financial planning and current normative measures (Bartolucci et al. 2005). It is evident that the forecast will systematically either overestimate or underestimate the effective cost: the institutional setting is aggregated so it does not consider the different effect of contractual renewals and new hiring, which depends on the category it refers to. That will be especially clear in the NHS, where the analysis of the distribution first and the econometric one after, will show the importance of considering the heterogeneity among government boards and, among these, the different structure of personnel qualifications.

These features make difficult reproduce the empirical income distribution trough an econometric model: the income distribution has a complex shape that does not fit to the commonly used distribution functions such as a normal or lognormal distribution (Clementi, and Gallegati 2004). Besides, the process of total income itself is complex, especially that of the public administration labor cost, where it is quite difficult to find related literature (Pittau, and Zelli 2002) and frequently data are affected by some recognizable errors (Brandolini 1999).

Such features are particularity stressed for the NHS, due to its intrinsic institutional complexity and the sub-national segmentation of the operational units (local health authorities, hospitals, etc.) (Venanzoni 1994). The importance of the NHS labor costs (in the year 2006 it is 13% of the public

administration (PA) total expenses and about 2,7% of the gross domestic product) requires monitoring and forecasting models, in order to process the mass of accounting and administrative information brought forth by the system itself. The policy maker should have a model that produces disaggregated forecasts considering both different institutional hypotheses and normative, simple to use at the same time.

The model described in the next paragraph, experimentally applied to the NHS, has been developed with the aim to provide the policy maker a flexible programming and forecasting tool for dependent work incomes. The paper is organized as follows.

Section 2 presents the data utilized in the analysis and shows the shape of income distribution in the National Health Service. In Section 3 the main characteristics will be described and through simulations we will show how this model better controls the effects of the wage dynamics compared to the ones used by the Ministry of Economics and Finance (MEF 2006, 155).

Section 4 concludes the paper.

## 2. Empirical distribution of income: a non-parametric approach

We use data extracted from the RGS data set SICO, which records all PA wages from 1997<sup>1</sup>. Data are available for personnel qualifications and boards. Additionally, we consider a part of wage (variable and fixed costs), which fills more than 90% of wage, relative only to non-executive personnel.

In a preliminary analysis we have been corrected gross data errors in all years and we have reduced to four years (1999-2002) because of the presence of some not recognizable errors. In the following, we focus analysis on a homogeneous balanced panel of boards (263 units for 301 observations overall).

In the NHS sector income movements arise from a collective agreement between trade union and government. It makes wage fit to inflation rate and to the movement of productivity.

In particular, in an imperfect competition setting, most theoretical models explain income movements as follows (Carlin - Soskice 1990):

$$\dot{\omega} = f(\dot{p}, p\dot{r}od, \varepsilon) \tag{1}$$

where  $\dot{\omega}$  is average wage fluctuations,  $\dot{p}$  and  $p\dot{r}od$  are, respectively, price and productivity movements,  $\varepsilon$  synthesizes other factors connected to bargaining. For simplicity, we suppose that shift distribution effects on wage came only from prices and productivity shocks (for instance, as results of renewal of collective agreement). This hypothesis leads us to build a model thinking to represent and to forecast this kind of shift impact on overall cost.

Because we want to isolate productivity effect on wage, to get rid of inflation data in Figure 1 are reported in 1995 prices using Consumption Price Index (CPI) issued by the National Institute of Statistics. This can help us to compare wage distributions across years:

<sup>&</sup>lt;sup>1</sup> The boards high turn-over - particularly marked in Lombardia due to the NHS reorganization - and their final migration from financial to economic accounting, suggested us to discard 1997 and 1998 data. We have used the most recent data made public (from 1999 to 2002).



Figure 1 shows the distribution of monthly wages in 1995 prices with Kernel non-parametric interpolation<sup>2</sup>. The panel reports the entire distribution from 1999 to 2002; the values on the *x*-axis are monthly wages in log scale. We note a significant shifting towards higher relative incomes with a substantial stability of lower incomes. In fact, while the 2000 distribution exhibits high density in the middle mass of income, from 2000 the thickness of the right tail increases, revealing a flatter distribution. This shape dynamic can be explained by engagement freeze started from 2000 involving a stable left tail (no engagement) against a thickness effect on right tail due to personnel seniority, promotions and professional qualifications changes moving from middle toward higher income.

In order to explore the stationarity of wage dynamics we show distribution normalized by average income of each year (Figure 2):



We observe that the plots collapse by normalization. Then, we can conclude that income distribution can be seen by a stationary distribution with multiplicative shift (Fujiwara *et al.* 2003).

<sup>&</sup>lt;sup>2</sup> In this paper the kernel function used is the Gaussian kernel.

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Figure 3 shows distribution of NHS nominal income. We observe the same dynamic distribution depicted in Figure 1. Now the average wage is translated from 3.2 to 3.3 (in log procapita): it corresponds to a 'shift' effect from 1738 to 2019 monthly procapita euro.



Three things emerge from this figure. First, we guess that the distribution shaped like the normal one (or lognormal if we consider the original values) and is rather stable over the four years, apart from a natural translation to the right. We check this graphical intuition with some tests that confirm the normality assumption<sup>3</sup>:

Table	1. 1	est	results
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Test	stat	<i>t</i> -value	<i>p</i> -value
K-S	D	0.065	0.15
S-F	V'	1.678	0.16
C-V	С	0.072	0.25
S-F	D	0.535	0.17

We have performed four tests. S-K is a sample of a non-parametric Kolmogorov-Smirnov test checking the null hypothesis that empirical data are samples from a normal distribution. As shown in Tabel 1, which reports the *t* statistic, the correspondent *t*-value and *p*-values for all the tests we made, the null hypothesis cannot be rejected at the usual 5% marginal significance level. S-F is Shapiro-Francia test, C-V is Cramer-von Mises test and A-D is Anderson-Darling test. The null hypothesis that the empirical distribution belongs to Gaussian two-parameter distribution cannot be rejected at the 5% marginal significance level.

From our data set we obtain the following maximum-likelihood estimates (*p*-values are in parentheses, Tabel 2):

<sup>&</sup>lt;sup>3</sup> We have reported 2002-year tests only, because of a non sensible change of *t*-test values in the other years.

Year	μ̂	σ̂	$R^2$
1999	3.23(0.00)	0.02(0.00)	0.985
2000	3.24(0.00)	0.03(0.00)	0.993
2001	3.27(0.00)	0.02(0.00)	0.985
2002	3.30(0.00)	0.02(0.00)	0.988

 Table 2. MLE estimations

where  $\hat{\mu}$  is the mean estimation and  $\hat{\sigma}$  is the standard deviation estimation. The fit of distribution is extremely good, as one can appreciate by noting the value of  $R^2$ .

The dynamic of public administration labor cost arises from decentralized wage bargaining, personnel seniority, promotions and professional qualifications changes. These elements can generate two distinct effects on the dynamic of labor cost: the 'shift' effect (the observed translation to the right of the distribution) and the 'share' effect (the change of in shape of distribution).

We are able to capture translation to the right ('shift' effect) with a wage index Iw (Paasche type) that synthesizes and brings all the relevant normative and economic information about NHS manpower:

$$Iw_{M,t} = \frac{\sum_{j=1}^{k} W_{.j,t} q_{.j,t}}{\sum_{j=1}^{k} W_{.j,02} q_{.j,t}}$$
(2)

where  $q_{.,j,t} = \frac{\sum_{i=1}^{I} N_{i,j,t}}{\sum_{i=1}^{I} \sum_{J=1}^{J} N_{i,J,t}}$  and  $w_{.,j,02} = \frac{\sum_{i=1}^{I} W_{i,j,02}}{\sum_{i=1}^{I} \sum_{J=1}^{J} N_{i,J,02}}$  (3)

 $(N_{i,j,t}$  represents the number of employees with professional qualification denoted with j, into the board i, at the time t;  $W_{i,j,t}$  represents the average wage of employee with professional qualification denoted with j, into the board i, at the time t).

This index has an important role when we introduce institutional hypotheses about NHS sector as a whole. In fact, it would be possible to translate wage settlements hypotheses into  $Iw_{M,t}$  values for each board and get consistent simulations of total wage bills. This index can be reproduced for each board in a slightly different formula:

k

$$Iw_{i,t} = \frac{\sum_{j=1}^{k} w_{i,j,t} q_{i,j,t}}{\sum_{j=1}^{k} w_{.,j,02} q_{i,j,t}}$$
(4)

where 
$$q_{i,j,t} = \frac{N_{i,j,t}}{\sum_{J=1}^{J} N_{i,j,t}}$$
 and  $w_{i,j,t} = \frac{W_{i,j,t}}{\sum_{J=1}^{J} N_{i,j,t}}$  (5)

The index  $Iw_{i,t}$  posses the same proprieties of  $Iw_{M,t}$  but it provides disaggregated information. In fact, it easily describes 'shift' effect inside each board, capturing the correlated wage dynamic.

One could observe a soft (left) asymmetry but a sensible flat form in the central body of distribution. In Figure 4 and Figure 5 we compare empirical distribution with the theoretical one (normalized values):



These shape characteristics can be interpreted as a wage transfer from middle-low wage boards in favor of high wage boards.

Then, we note a deformation of the slope and of the curvature over the years. This represents a change of personnel qualifications structure that we catch through a quantity index Iq (Laspeyres type, 2002 base year):

$$Iq_{M,t} = \frac{\sum_{j=1}^{k} W_{,j,02} q_{,j,t}}{\sum_{j=1}^{k} W_{,j,02} q_{,j,02}}$$
(6)

where 
$$q_{.,j,t} = \frac{\sum_{i=1}^{I} N_{i,j,t}}{\sum_{i=1}^{I} \sum_{J=1}^{J} N_{i,j,t}}$$
 and  $w_{.,j,02} = \frac{\sum_{i=1}^{I} W_{i,j,02}}{\sum_{i=1}^{I} \sum_{J=1}^{J} N_{i,j,02}}$  (7)

 $(N_{i,j,t}$  represents the number of employees with professional qualification denoted with j, into the board i, at the time t;  $W_{i,j,t}$  represents the average wage of employee with professional qualification denoted with j, into the board i, at the time t).

Analogously to wage index, also Iq can be reproduced for each board in a slightly different formula:

$$Iq_{i,t} = \frac{\sum_{j=1}^{k} W_{.,j,02} q_{i,j,t}}{\sum_{j=1}^{k} W_{.,j,02} q_{.,j,02}}$$
(8)

where 
$$q_{.,j,t} = \frac{\sum_{i=1}^{I} N_{i,j,t}}{\sum_{i=1}^{I} \sum_{j=1}^{J} N_{i,j,t}}$$
 and  $w_{.,j,02} = \frac{\sum_{i=1}^{I} W_{i,j,02}}{\sum_{i=1}^{I} \sum_{j=1}^{J} N_{i,j,02}}$  (9)

This index describes 'share' effect inside each board, capturing the correlated personnel qualifications structure.

#### 3. Model and results

The model consists of one identity and four stochastic equations (ARIMA(1,1,0) type), to be estimated on the pooled data set:

$$c_{i,t} = C_{i,t} - M_{i,t} \tag{10}$$

$$\Delta I_{W_{i,t}} = \beta' \Delta I_{W_{i,t-1}} + \gamma' \Delta I_{W_{M,t}} + \varepsilon_{i,t} \quad (\beta' = -0.13(0.00); \gamma' = 1.02(0.00), \ R^2 = 0.50)$$
(11)

$$\Delta Iq_{i,t} = \beta^{*} \Delta Iq_{i,t-1} + \gamma^{"} \Delta Iq_{M,t} + \varepsilon_{i,t} \quad (\beta^{*} = -0.12(0.00); \gamma^{"} = 1.08(0.00), \mathbb{R}^{2} = 0.70)$$
(12)

$$\Delta M_{i,t} = \beta^{"} \Delta M_{i,t-1} + \gamma^{"} \Delta M_{M,t} + \varepsilon_{i,t} \ (\beta^{"} = -0.02(0.00); \ \gamma^{"} = 1.02(0.00), R^{2} = 0.22)$$
(13)

$$C_{i,t} = w_{i,02} * \left(\frac{1}{Iw_{i,02} * Iq_{i,02}}\right) * Iw_{i,t} * Iq_{i,t} * M_{i,t}$$
(14)

The residual terms  $\varepsilon_{i,t}$  are idiosyncratic shocks and follow a standard normal distribution. The variables are expressed in logarithmic values.

An important feature is that the wage (Eq. (14)) is obtained from the product of five elements: the average wage, a quantity index Iq and a wage index Ip calculated on the base year (2002); a quantity index Iq and a wage index Iw calculated on the t-generic year; monthly installments  $M_{i,t}$  calculated on the t-generic year. Then the wage so defined is a joint measure of three observation-specific effects: a 'share', based on the personnel qualifications structure (weighed with a given average national wage); a 'shift', based on average wages dynamic (weighed with observation-specific personnel qualifications structure); a composite effect, represented by monthly installments.

Eq. (11) and (12) are respectively wage and quantity index equation. In our specification, equations are composed by two compound terms: a 'mean' term synthesised by  $\Delta I w_{M,t}$  (or  $\Delta I q_{M,t}$ ) that captures the overall ('shift' o 'share') effects of sector; a 'specific' effect term  $\Delta I p_{i,t-1}$  (or  $\Delta I q_{i,t-1}$ ) that characterizes board variability and works to reinforce the 'mean' effect if it is positive, to weaken it if it is negative. Thus the specification assumes that the diverging shock in board wage occurs in relation to the average wage, passing through the lagged wage of board. The same thing

happens in Eq. (13) that represents the monthly instalments dynamic. Eq. (10) is the identity to define procapita values of wage per board (in logarithmic).

The simulation analysis gives us more than a reason to think that the model is able to control the effects of wage dynamics described above. This represents an improvement compared to the one currently in use by the Ministry of Economics and Finance (e.g., (MEF 2006) and (FELICI *et al.* 2004)).

We identify four causes of improvement. First, unlike the model described here, in the previous the wage is obtained as output regression<sup>4</sup>. This implies that the wage equation brings a specific error in simulation, involving an over or under estimation in all cases and a qualitative worsening of the results. Secondly, our model matches very well the log-normal distribution also in simulation. Then, our model does not produce 'distortion' effects in distribution. We check these properties by simulation<sup>5</sup> over four periods connected to the same hypothesis ( $\Delta Iw = 0$ ;  $\Delta Iq = 0$ ).

We show that our model can simulate the same distribution and capture the properties connected with *Ip* and *Iq* indices as described above. Figure 6 summarizes the results of simulations assuming 'shift' and 'share' effects null.



We observe that the simulations hold the log-normal stationary distribution in all cases. Then, simulated distribution matches the empirical distribution very well. This property can be also shown graphically before shocking only Iq ('share' effects only, Figure 7), then mixing shocks on Ip and Iq together ('share' and 'shift' effects together, Figure 8) by four other simulation periods.

<sup>&</sup>lt;sup>4</sup> We care to remind this equation (without dummies variables):

 $c_{i,t} = \alpha + \beta * M_{i,t} + \gamma * Iq_{i,t} + \delta * Iw_{i,t} + \varepsilon_{i,t} \,.$ 

<sup>&</sup>lt;sup>5</sup> We suppose that the parameters of simulation (estimated by regression) are constant over the four period of simulation; then, we run the model (by using SAS) introducing shocks through  $Iw_{M,t}$  or  $Iq_{M,t}$  for all simulation times and taking 2002 data as initial values.



The results reflect different effects and mime the empirical distribution well. So, we are sure that our model is versatile to produce a realistic shifting under various set of institutional and normative hypothesis.

Instead, Figure 9 shows the same simulation (four periods) when the previous model runs assuming  $\Delta Iw = 0$  and  $\Delta Iq = 0$ . (MEF 2006, 155)



We see that that model is not able to control 'share' and 'shift' effects: we note a 'shift' effect against the simulation hypothesis that  $\Delta Ip = 0$  and a change of shape of the distribution against the hypothesis  $\Delta Iq = 0$  (compare Figure 9 with Figure 6). This behavior is connected to wage equation as defined (see note 4): it is the graphical counterpart of a specific error in the wage regression discussed above. Thirdly, our model fit data better then previous model. On the whole, we have that  $R^2$  is higher than the correspondent when it is calculated on the same period of time<sup>6</sup>. At the end, we easily obtain a value index multiplying quantity index Iq and price index Ip. This property provides us interesting insights for the wage dynamics.

#### 4. Concluding remarks

Having accurate forecast models is essential for an effective programming. In this paper we present a forecast of dependent work incomes in the PA with two features: highly disaggregated level, which consents to provide accurate estimates of specific normative hypothesis, and simplicity of use. The model, experimentally applied to the HNS, also enables us to discern the 'shift' effect, captured by a wage index of Paasche type and the 'share' effect, expressed by a quantity index of Laspeyres type. Then, we are able to make differentiated hypotheses on different scenarios: if we want to shock the shape of income distribution we can move Iq; if we want to translate wage settlements hypotheses, we can insert into Iw suitable values for each board. Three different simulations reveal some of the model's analysis potentialities, making particular reference to the ability to control wage dynamics.

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<sup>&</sup>lt;sup>6</sup> We can compare some equations only. For instance,  $R^2$  of monthly instalments equation is 0.09 in MEF model (0.22 for our model);  $R^2$  of wage and quantity index equation is, respectively, 0.20 (0.50 for our model) and 0.40 (0.70 for our model).

# BUBBLES AND CRASHES IN FINANCE: A PHASE TRANSITION FROM RANDOM TO DETERMINISTIC BEHAVIOUR IN PRICES

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#### Abstract

We develop a rational expectations model of financial bubbles and study how the risk-return interplay is incorporated into prices. We retain the interpretation of the leading Johansen-Ledoit-Sornette model: namely, that the price must rise prior to a crash in order to compensate a representative investor for the level of risk. This is accompanied, in our stochastic model, by an illusion of certainty as described by a decreasing volatility function. As the volatility function goes to zero, crashes can be seen to represent a phase transition from stochastic to deterministic behaviour in prices.

Keywords: financial crashes, super-exponential growth, illusion of certainty, housing bubble

#### JEL Classification: C52, C53, G01, G17

#### **1.Introduction**

Rational expectations models were introduced with the work of Blanchard and Watson to account for the possibility that prices may deviate from fundamental levels (Sornette, and Malevergne 2001). We take as our main starting point the somewhat controversial subject of log-periodic precursors to financial crashes (Feigenbaum, and Freund 1996, Sornette, and Johansen 1997, Laloux *et al.* 1999, Johansen *et al.* 2000, Feigenbaum 2001a, 2001b, Johansen 2002, 2004, Chang, and Feigenbaum 2006, 2008). A fundamental aim of our approach is relatively easy calibration of our model to empirical data. Additional background on log-periodicity and complex exponents can be found in Sornette (1998). A first-order approach in Johansen *et al.* (2000) and subsequent extensions in Zhou and Sornette (2006) state that prior to a crash the price must exhibit a super-exponential growth in order to compensate a representative investor for the level of risk. However, this approach concentrates solely on the drift function and ignores the underlying volatility fluctuations which typically dominate financial time series (Cont, and Tankov 2004). Similar in spirit to Johansen *et al.* (2000), we derive a second-order condition which incorporates volatility fluctuations and enables us to combine insights from a rational expectations model with a stochastic model (Sornette, and Andersen 2002, Andersen, and Sornette 2004).

Our model gives two important characterisations of bubbles in economics. Firstly, a rapid superexponential growth in prices. Secondly, an illusion of certainty as described by a decreasing volatility function prior to the crash. As the volatility function goes to zero bubbles and crashes can be seen to represent a phase transition from stochastic to purely deterministic behaviour in prices. This clarifies the oft cited link in the literature between phase transitions in critical phenomena and financial crashes. Further, this recreates the phenomenology of the Sornette-Johansen paradigm: namely that prices resemble a deterministic function prior to a crash. We explore a number of different applications of our model and the potential relevance to recent events is striking.

The layout of this paper is as follows. In Section 2 we introduce the basic model and derive the crash-size distribution, the post-crash dynamics, simple estimates of fundamental-value and speculative-bubble components. Section 3 describes an empirical application to the UK housing bubble of the early to late 2000s (Zhou, and Sornette 2003). Section 4 is a brief conclusion.

#### 2.The model

In this section we give an alternative formulation of the model solution in Johansen *et al.* (2000). This leads naturally to a stochastic generalisation of the original model, which is then solved in full to give empirical predictions for the distribution of crash-sizes, post-crash dynamics, fundamental values and the level of over-pricing.

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We offer an alternate derivation of the basic model in Johansen *et al.* (2000) as follows. Let P(t) denote the price of an asset at time *t*. Our starting point is the equation

$$P(t) = P_1(t)(1-\kappa)^{j(t)},$$
(1)

where  $P_{l}(t)$  satisfies

$$dP_{1}(t) = \mu(t)P_{1}(t)dt + \sigma(t)P_{1}(t)dW_{t},$$
(2)

where  $W_t$  is a Wiener process and j(t) is a jump process satisfying the condition j(t)=0 before a crash and the condition j(t)=1 afterwards. When a crash occurs  $\kappa$  % is automatically wiped off the value of the asset. Prior to a crash  $P(t)=P_1(t)$  and  $X_t=\log(P(t))$  satisfies

$$dX_t = \widetilde{\mu}(t)dt + \sigma(t)dW_t + \ln[1 - \kappa]dj(t), \qquad (3)$$

where  $\tilde{\mu}(t) = \mu(t) - \sigma^2(t)/2$ . If a crash has not occurred by time *t*, we have that

$$E[j(t+dt) - j(t)] = h(t)dt + o(dt),$$
(4)

and

$$Var[j(t+dt) - j(t)] = h(t)dt + o(dt),$$
(5)

where h(t) is the hazard rate. We compare (3) with the prototypical Black-Scholes model for an asset price:

$$dX_t = \widetilde{\mu}dt + \sigma dW_t, \tag{6}$$

where  $\tilde{\mu}(t) = \mu - \sigma^2 / 2$ , and use (6) as our model for 'fundamental' or purely stochastic behaviour in prices.

The first-order condition, see e.g. Sornette and Malevergne (2001), Johansen *et al.* (2000), suggests that  $\tilde{\mu}(t)$  in (3) grows in order to compensate a representative investor for the risk associated with a crash. The instantaneous drift associated with (3) is

$$\widetilde{\mu}(t) + \ln[1 - \kappa]h(t). \tag{7}$$

For (6) the instantaneous drift is  $\tilde{\mu}$ . Setting (7) equal to  $\tilde{\mu}$ , it follows that in order for bubbles and non-bubbles to co-exist.

$$\widetilde{\mu}(t) = \widetilde{\mu} - \ln[1 - \kappa]h(t). \tag{8}$$

If we ignore volatility fluctuations by setting  $\sigma(t) = \sigma$ , then our pre-crash model for an asset price becomes

$$dX_t = (\tilde{\mu} - \ln[1 - \kappa]h(t))dt + \sigma dW_t.$$
(9)

However, this is actually a rather poor empirical model (Fry 2008), failing to adequately account for the volatility fluctuations in (3). Under a Markowitz interpretation, means represent returns and variances/standard deviations represent risk. Suppose that in (3)  $\sigma(t)$  adapts in an analogous way to  $\mu(t)$  so as to compensate a representative investor for bearing additional levels of risk. The instantaneous variance associated with (3) is

$$\sigma^2(t) + (\ln[1-\kappa])^2 h(t). \tag{10}$$

For (6) the instantaneous variance is  $\sigma^2$ . Setting (10) equal to  $\sigma^2$ , the second-order condition for the co-existence of bubbles and non-bubbles becomes

$$\sigma^{2}(t) = \sigma^{2} - (\ln[1 - \kappa])^{2} h(t).$$
(11)

(11) illustrates an *illusion of certainty* – a decrease in the volatility function - which arises as part of the bubble process. Intuitively, in order for a bubble to occur not only must returns increase but the volatility must also decrease. If this does not happen (6) with an instantaneous variance of  $\sigma^2$  would represent a more attractive and less risky investment than a market described by (9) and bubbles could not occur. We use (6) as a model of a 'fundamental' or purely stochastic regime, as in Black-Scholes theory. From (11), our model for prices under a bubble regime becomes

$$dX_{t} = [\tilde{\mu} - \ln[1 - \kappa]h(t)]dt + \sqrt{\sigma^{2} - (\ln[1 - \kappa])^{2}h(t)}dW_{t}.$$
(12)

The simplest h(t) considered in Johansen *et al.* (2000) is

$$h(t) = B(t_c - t)^{-\alpha}, \tag{13}$$

where it is assumed that  $\alpha \in (0,1)$  and  $t_c$  is a critical time when the hazard function becomes singular by analogy with phase transitions in statistical mechanical systems (Yeomans 1992). Here, we choose on purely statistical grounds

$$h(t) = \frac{\beta t^{\beta - 1}}{\alpha^{\beta} + t^{\beta}}.$$
(14)

This hazard function corresponds to a log-logistic distribution and is intended to capture the essence of the previous approach as the hazard function has both a relatively simple form and, for  $\beta > 1$ , has a non-trivial mode at  $t = \alpha (\beta - 1)^{1/\beta}$ , with modal point  $(\beta - 1)^{1-1/\beta} / \alpha$ . For these reasons, the log-logistic distribution is commonly used in statistics (Cox and Oakes 1984). The log-logistic distribution has probability density

$$f(x) = \frac{\beta \alpha^{\beta} x^{\beta-1}}{(\alpha^{\beta} + x^{\beta})^2},$$
(15)

on the positive half-line. The cumulative distribution function is

$$F(x) = 1 - \frac{\alpha^{\beta}}{\alpha^{\beta} + x^{\beta}}.$$
(16)

The model (12) with h(t) given by (14) has the solution

$$X_{t} = X_{0} + \widetilde{\mu}t + \nu \ln\left(1 + \frac{t^{\beta}}{\alpha^{\beta}}\right) + \int_{0}^{t} \sqrt{\sigma^{2} - \nu^{2} \frac{\beta t^{\beta - 1}}{\alpha^{\beta} + t^{\beta}}} dW_{u} , \qquad (17)$$

where  $v = -\ln[1 - \kappa]$  with v > 0. From (17) the conditional densities can be written as

$$X_t \mid X_s \sim N(\mu_{t|s}, \sigma_{t|s}^2), \tag{18}$$

where

$$\mu_{t|s} = X_s + \widetilde{\mu}(t-s) + \nu \ln\left(\frac{\alpha^{\beta} + t^{\beta}}{\alpha^{\beta} + s^{\beta}}\right),\tag{19}$$

and

$$\sigma_{t|s}^{2} = \sigma^{2}(t-s) - v^{2} \ln\left(\frac{\alpha^{\beta} + t^{\beta}}{\alpha^{\beta} + s^{\beta}}\right).$$
(20)

Under the fundamental equation (6) these expressions are simply  $\mu_{t|s} = X_s + \tilde{\mu}(t-s)$  and  $\sigma_{t|s}^2 = \sigma^2(t-s)$ . Thus, we see that under the bubble model the incremental distributions demonstrate a richer behaviour over time.

The fundamental or purely stochastic non-bubble model (6) corresponds to the case that  $\kappa = 0$ , or equivalently that  $\nu=0$ . We can test for bubbles by testing the null hypothesis  $\nu=0$  (no bubble) against the alternative hypothesis  $\nu>0$  (bubble). This can be simply done using a (one-sided) *t*-test since maximum likelihood estimates, and estimated standard errors, can be easily calculated numerically from (19). A range of further implications of our bubble model can be derived as we describe below.

*Crash-size distribution.* Suppose that prices are observed up to and including time t and that a crash has not occurred by time t. The crash-size distribution resists an analytical description but a Monte Carlo algorithm to simulate the crash-size C is straightforward and reads as follows:

1. Generate *u* from *U*~Log-logistic ( $\alpha, \beta$ ) with the constraint  $u \ge t$ .

2. 
$$C \sim \kappa e^{Z}$$
,

where

$$Z \sim N\left(X_{t} + \mu u + v \ln\left(\frac{\alpha^{\beta} + u^{\beta}}{\alpha^{\beta} + t^{\beta}}\right), \sigma^{2} - v^{2} \ln\left(\frac{\alpha^{\beta} + u^{\beta}}{\alpha^{\beta} + t^{\beta}}\right)\right).$$
(21)

We note that simulating u from the log-logistic distribution is straight-forward and from (16) possible via inversion using

$$F^{-1}(x) = \alpha \left(\frac{x}{1-x}\right)^{\frac{1}{\beta}}$$
 or  $F^{-1}(x) = \left(\frac{\alpha^{\beta} + t^{\beta}}{1-x} - \alpha^{\beta}\right)^{\frac{1}{\beta}}$  with constraint  $u \ge t$ .

Post-crash increase in volatility. Before a crash equation (17) applies and the volatility is

$$\sqrt{\sigma^2 - \frac{v^2 \beta t^{\beta - 1}}{\alpha^\beta + t^\beta}}.$$
(22)

After a crash, the price reverts to the fundamental price dynamics (6) and the volatility is  $\sigma$ . Thus our model predicts an increase in volatility following a crash given by

$$\sigma - \sqrt{\sigma^2 - \frac{v^2 \beta t^{\beta - 1}}{\alpha^{\beta} + t^{\beta}}}.$$
(23)

Equivalently, our model predicts an increase in squared volatility following a crash given by

$$\frac{v^2 \beta t^{\beta-1}}{\alpha^\beta + t^\beta}.$$
(24)

*Fundamental values.* The above model suggests a simple approach to estimate fundamental value. Under the fundamental dynamics (6)

$$P_F(t) \coloneqq E(P(t)) = P(0)e^{\mu t}, \qquad (25)$$

and we use (25) to estimate fundamental value in our empirical application in Section 3. This approach recreates the widespread phenomenology of approximate exponential growth in economic time series (see e.g. Chapter 7 in Campbell *et al.* (1997)).

Estimated bubble component. Define

$$H(t) = \int_{0}^{t} h(u)du.$$
(26)

Under the fundamental model E(P(t)) is given by (25). Under the bubble model, since  $X_t = \log(P(t))$  satisfies

$$X_t \sim N \Big( X_0 + \widetilde{\mu} t + v H(t), \sigma^2 t - v^2 H(t) \Big), \tag{27}$$

it follows that

$$P_B(t) := E(P(t)) = P(0)e^{\mu t + \left(v - \frac{v^2}{2}\right)H(t)}.$$
(28)

This motivates the following estimate for the proportion of observed prices which can be attributed to a speculative bubble:

$$\int_{0}^{T} \frac{P_{F}(t)}{P_{B}(t)} dt = 1 - \frac{1}{T} \int_{0}^{T} \left( 1 + \frac{t^{\beta}}{\alpha^{\beta}} \right)^{-(\nu - \nu^{2}/2)} dt.$$
(29)

## **3.**Empirical application

As an empirical application we consider the UK housing bubble from 2002-2007 by modelling a monthly time series of average UK house prices. The null hypothesis of no bubble is a test of the hypothesis v=0. This can be tested using a one-sided *t*-test - dividing the estimate  $\hat{v}$  by its estimated standard error and comparing to a normal distribution. For this data set we obtain a *t*-statistic of 3.66 and a *p* value of 0.0001 to give strong evidence of a bubble in this data.

From our fit of the bubble model (17) we use  $P_F(t) = P(0)e^{ut}$  in (25) as a simple estimate of fundamental value. A plot of UK house prices together with estimated fundamental values and associated 95% confidence intervals is shown in Figure 1. Prices appear to be well in excess of fundamental values, with prices lying above the upper confidence limits of the estimated fundamental values throughout the sample (Figure 1 to the left of the vertical line). We then estimate fundamental value for the years 2008-2009 using data from 2002-2007 only and compare with the actual historically observed prices. That is, we use our model to provide estimates of fundamental value *out of sample*. The results are shown to the right of the vertical line in Figure 1 and show prices reverting towards fundamental values - moving inside the confidence intervals constructed for fundamental value. From the second half of 2008 observed prices are statistically indistinguishable from estimated fundamental value. Finally, the estimated speculative bubble component is 0.202 suggesting that the bubble accounts for around 20% of the observed prices. This compares reasonably with similar estimates of 12-25% in Black *et al.* (2006) and 28-53% in Hott and Monnin (2008).


**Figure 1.** Plot of average UK house-prices and estimated fundamental value (dashed line) and associated 95% confidence intervals (dots). Estimation takes place over the period 2002-2007 (to the left of the dashed vertical line). Out-of-sample estimates of fundamental value are then compared to historically observed prices (to the right of the dashed vertical line).

#### 4.Conclusions

This paper has provided a stochastic version of the model in Johansen *et al.* (2000). Crash precursors are a super-exponential growth accompanied by an 'illusion of certainty', characterised by a decrease in the volatility function prior to the crash. A range of potential applications to economics were discussed including statistical tests for bubbles, crash-size distributions, predictions of a post-crash increase in volatility and simple estimates of fundamental-value and speculative-bubble components. As a brief empirical application we consider the UK housing bubble in the early to mid 2000s. Over the years 2002-2007 prices appear to be in excess of fundamental levels, with the speculative bubble component accounting for around 20% of observed prices. In addition, prices are seen to revert towards estimated fundamental values out of sample over the period 2008-2009.

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# STOCK MARKET INTEGRATION IN THE EMERGING MARKETS: SOME EMPIRICAL EVIDENCE

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#### Abstract:

Numerous studies have investigated long-run relationship between emerging stock markets, but few interests have been focused on emerging markets in the Middle East region. In this paper we aim to investigate financial integration among five emerging stock markets in the Middle East region by using co-integration analysis. In the paper it is also examined that integration between these emerging markets and developed markets represented by US, UK and France. This will provide opportunity for to test the contagion effect of a possible crisis between developed and emerging markets. The empirical results show that all stock markets sampled are integrated with each other, which implies a limited diversification opportunities for regional investors. On the other hand the Middle Eastern stock markets promise long-run gains through portfolio diversification for international investors.

Keywords: stock market lintegration, emerging markets, co-integration analysis

Jel Classification: C22, F36, G15

#### 1. Introduction

Financial markets all over the world have witnessed growing integration within as well as across boundaries, spurred by deregulation, globalization and advances in information technology. Capital has become more mobile across national boundaries as nations are increasingly relying on savings of other nations to supplement the domestic savings. Technological developments in electronic payment and communication systems have substantially reduced the arbitrage opportunities across financial centers, thereby easing the cross border mobility of funds. As may be expected, financial markets tend to be better integrated in developed countries. At the same time deregulation in developing market economies has led to removal of restrictions on pricing of various financial assets, which is one of the pre-requisites for market integration (RCF 2006, 285). Additionally, diversification benefits also enhance and motivate the integration of markets.

Financial theory suggests that an integrated regional market is more efficient than segmented national markets. Financial integration is the process through which a country's financial markets become more closely integrated with those in other countries or with those in the rest of the world.

In this paper we aim to investigate financial integration among five emerging stock markets in the Middle East region by using multivariate co-integration technique. In the paper it is also examined that integration between these emerging markets and developed markets represented by US, UK and France. In this way, it would be possible to identify the markets which are regionally and/or internationally integrated, and diversification potentials offered by the equity markets in the Middle East region. Moreover, this will provide opportunity for to test the contagion effect of a possible crisis between developed and emerging markets. The paper is planned as follows: in the next section, the subject of measuring and testing stock market integration is outlined. An overview on financial market development in the Middle Eastern countries is given in Section 5. In Section 6, brief information on the employed methodology and data issue are discussed. Results are presented in Section 6.

### 2. Previous Studies

Beginning with the pioneering study of Kasa (1992), who found that there is a common trend driving the developed markets, a large literature has emerged focusing to measure and test the level of integration between the mature stock markets. But, in recent years a few studies have been conducted

on interdependencies among emerging markets. As Chen *et al.* (2002) stressed, emerging markets provide a useful separate data source to investigate the market integration hypothesis given their low correlation with developed markets. Hence, the potential data-snooping biases are reduced.

International financial integration is increasing because of lifting capital account restrictions in many countries, being also dismantled other barriers to investing overseas, increasing of activities in international financial markets over the last decades (Lane, and Milesi-Ferretti 2003). Consequently many studies were focused on international financial integration. In the some empirical studies suggests that significant capital market integration exists among major industrialized countries (Meric, and Meric 1989, Koutmos 1996, Sinquefield 1996, Ben Zion *et al.* 1996, Freimann 1998, and Bowe, and Mylanidis 1999). But, linkages among emerging markets and between these developed markets were been relatively weak (Korajczyk 1996, Hakim, and Andary 1997, and Bekaert, and Harvey 1997).

Gilmore and McManus (2001) examined relationships between the US stock market and three Central European markets (Hungary, Poland, Czech Republic) over the 1995-2001 period. Egert and Kocenda (2005) used intraday data and found no robust co-integration relationship between the three Vysegrad markets and a group of developed markets. In the study of Rockinger and Urga (2001) integration of the four emerging markets (Czech Republic, Hungary, Poland, Russia) over the 1994-1997 period was explored. Scheicher (2001) study the regional and global integration of stock markets in Hungary, Poland and the Czech Republic (Syllignakis and Kouretas 2006).

In these studies different indicators were used for measuring financial integration effects. For example Bekaert and Harvey (2000) used an asset price model and Henry (2000), Levine *et al.* (2000), Edison *et al.* (2002), Edison and Warnock (2002) and O'Donnell (2002), amongst others, used various indicators (Lane, and Milesi-Ferretti 2003). Finally, based on a review of the literature on financial integration, on can classify existing indicators of financial integration into four broad categories (Pagano 2010):

- 1. indicators of credit and bond market integration;
- 2. indicators of stock market integration;
- 3. indicators of integration based on economic decisions of households and firms; and
- 4. indicators of institutional differences that may induce financial market segmentation.

# **3. Financial Integration**

The notion of 'financial integration' means the abolishment of the limitations which stem the capital flows in financial markets and a process of which capital mobility has advanced. As financial and capital markets are liberalized and continue to open, international stock prices tend to co-move closer and integrate than before. The co-movement and integration of international stock markets is estimated by employing various techniques, such as cross-market correlation coefficients, investment restrictions, asset pricing models and some econometric techniques. The common factor for most of these approaches is the 'law of one price'. That is, when transaction costs and taxes are not taken into account, identical securities should carry the same price across all stock markets where such securities should be priced identically within both markets and investors will be able to allocate capital where it is the most productive (Marashdeh 2005, Click, and Plummer 2005). However, an integrated regional stock market will be more appealing to investors from outside the region who would find investment in the region easier and or more justifiable. As shares become more liquid and transaction costs fall, fund managers become increasingly willing to take positions in the stock markets (Click, and Plummer 2005).

Integrated financial markets assume vital importance for several reasons:

1. Integrated markets constitute as a channel for authorities to transmit important price signals;

2. Efficient and integrated financial markets serve as a mean for promoting domestic savings, investment and economic growth;

**3.** Financial market integration fosters and even imposes the necessary condition for a country's financial sector to emerge as an international or a regional financial center;

4. By enhancing competition and efficiency of intermediaries in their operations and allocation of resources, financial market integration contributes to financial stability;

5. Integrated markets lead to innovations and cost effective intermediation, thereby improving access to financial services for members of the public, institutions and companies alike;

6. Integrated financial markets induce market discipline and informational efficiency;

7. Market integration promotes the adoption of modern technology and payment system to achieve cost effective financial intermediation services (RCF 2006, 285).

Along with these benefits, financial integration brings certain costs, too (for a detailed discussion of the costs and benefits of financial integration *see* Agénor, 2003). It is widely believed that the benefits outweigh the costs, provided that mechanisms of controlling for financial stability are implemented.

Although the term 'stock market integration' refers to a broad concept, it subsumes such phenomena as multiple listing, cross border trading, and investment services by foreign firms. Oftentimes these activities are referred to as 'globalization' or 'internationalization' of stock markets. Greater degree of stock market integration generally implies greater degree of co-movements. In the literature on international finance 'market integration' is used to describe a situation in which financial assets having the same profile of risk and return are priced similarly. These two definitions of integration do not exclude each other. Rather, they are strongly connected, since multiple listing and international trading lead to integration in its economic meaning (Licht 1997, 2).

An accurate assessment of the degree of co-movements among international stock markets is of interest for a number of reasons. From the investors' point of view, the optimal design of a well-diversified portfolio depends on a proper understanding of stock market correlations. Changes in co-movement patterns call for an adjustment of portfolios. Policy makers are also interested in the links between stock markets because of their implications for the stability of the financial system.

However, international financial integration also exposes the domestic economy to certain risks. An integrated market via extensive economic and financial liberalization is more prone to volatility, i.e. tendency of financial markets to go through boom and bust cycles in which capital flows grow and then contract. Another risk is spillover effect of external financial crises. With increased financial and trade sector interdependence within a region, it is generally believed that the vulnerability of financial markets to external shocks further increased in many emerging economies. These risks, if not managed well, could have serious implications as was observed in the previous financial crises in Latin America (1994), Asia (1997) and Russia (1998). In the literature, this phenomenon is called as 'contagion' (Khalid, and Kawai 2003, 133).

Despite numerous empirical studies which have focused on developed stock markets in different parts of the world, especially the US and Europe, and other emerging stock markets in Latin America, South Asia and Pacific-Basin, the stock markets in the Middle East region have not been discussed and examined deeply despite the exceptional international role and importance of this region on the international economic and political events (Marashdeh, and Wilson 2005, 2).

# 4. Measuring and Testing Stock Market Integration

To test and measure for financial integration, both fields of international macroeconomics and international finance have developed different but related methodologies. In international macroeconomics, much work has utilized interest rate parity conditions to test for financial integration of money markets, while much of the international finance literature has employed a *Capital Asset Pricing Model* (CAPM). Regarding the empirical implementation of these concepts, various econometric methodologies have been suggested over the years. Early attempts to test for international linkages of equity markets have mostly focused on VAR models and generally found rising cross-market correlations and growing regional interdependence. More recent research on financial market integration has been conducted in a GARCH framework in order to take into account the existence of ARCH effects in data of higher frequency.

Meanwhile, the issue of time-varying nature of financial integration is ignored in general. Although comparing different sub-periods may yield a roughly idea for long term changes, the degree of integration may often change frequently and exhibit high volatility (Fratzscher 2001). For instance, correlation across markets is found to be higher during phases of a financial crisis and failure to account for that may lead to misleading interpretations (Forbes, and Rigobon 1999). Therefore, to depend only on correlations does not give an appropriate way of assessing interrelationship among markets.

As Beine and Candelon (2007) pointed out, using average correlations over a particular period might be suited for identifying factors, such as distance or language similarity that influence only the cross-sectional differences in stock returns but do not vary over time. However, it prevents the sound investigation of the role of factors that vary not only across countries but also over time. In this respect, the study of the impact of reforms which aim at liberalizing trade flows or financial investments requires the use of a time varying measure of cross-country correlation.

# 5. Financial Development In The Middle East Countries

The Middle East region covers many countries which are Arab in general except Israel and Iran. Some definitions accept Turkey as a Middle Eastern country, too. The countries of the region are classified as low to middle-income by World Bank. The region, where peoples from different cultures and beliefs live, is one of the most high-tensioned area in the world. Since the mid-eighties, many Middle Eastern countries have tried to implement in their financial sectors in order to achieve high growth performance. These reforms were part of an overall strategy toward establishing a more market-based and private sector-led economy (Abu Bader, and Abu Qarn 2006). Most of the countries in the region have reformed their financial sectors over the past three decades. Arab stock markets have expanded in the 1990s, buoyed by capital inflows, privatization, and government policy designed to induce firms to list in the market (Omran and Bolbol 2003, 238). However, while they have made progress, their efforts have been eclipsed by faster reform and growth in other parts of the world.

Middle Eastern countries do not treat international or even intra-regional capital investments uniformly. Financial integration remains a distant goal, and has been overtaken by smaller more functional arrangements, such as Gulf Cooperation Council (GCC). Specifically, GCC countries have traditionally discriminated against non-GCC investors, but the rest of the regional markets, particularly those of Jordan, Egypt and Turkey are largely open to Middle Eastern investors and have become leading capital markets in the region. These markets offer capital-rich GCC equity investors unique diversification benefits associated with optimum portfolios with a balanced mix of domestic and international securities (Neaime 2002, 2).

Financial markets of Middle East countries promise significant potential and classified often as a group apart from other emerging or international markets. These markets also have recently become of significant interest to world investors and policy makers, due to the fact that there has been an important flow of funds into these emerging financial markets, especially after the recent financial crises. As foreign participation in these markets continues to increase, the role that these markets play in the world economy also becomes more important (Neaime 2006, 457).

### 6. Empirical Analysis

### 6.1. Variables and Data Issue

We were intended to include all Middle Eastern countries, but due to the lack of data and that some countries have not created stock markets, the sample covered only 6 of Middle East countries besides of 3 representative developed markets, namely Egypt, Turkey, Jordan, Lebanon, Iran, France, the US and UK. These developed markets are among the largest stock markets in the world and play a vital role in their economies. Especially the US is the largest economy in the world and most of the countries from the Middle East have a strong economic relationship with the US.

The stock market data used in this paper are gathered from Morgan Stanley Capital International (MSCI). Instead of to use local stock price indices we preferred to use the MSCI indices for several reasons. First, these indices are constructed on a consistent basis by MSCI, so it makes cross-country comparison more meaningful. Second, these indices are value-weighted reflects a substantial percentage of total market capitalization which could minimize the problem of serial correlation in returns result from non-synchronous trading. Third, MSCI indices are widely employed in the literature on the basis of the degree of comparability and avoidance of dual listing (Maghyereh 2004, 30).

	FR	UK	US	EGY	TUR	JOR	LEB	IR
Mean	7.218	7.316	6.995	6.412	12.932	5.877	6.402	9.131
Median	7.209	7.319	7.021	6.873	13.005	6.063	6.555	9.209
Max.	7.599	7.598	7.290	7.688	13.668	6.596	7.278	9.513
Min.	6.787	6.997	6.567	4.540	11.873	5.011	5.653	8.359
Std.Dev.	0.231	0.176	0.183	1.031	0.522	0.488	0.536	0.309
Skew.	-0.037	-0.065	-0.403	-0.580	-0.504	-0.494	-0.056	-1.268
Kurto.	1.792	1.697	2.177	1.897	2.015	1.855	1.538	3.641
J – B	5.065	5.928	4.594	8.857	6.860	7.904	7.438	23.676
р	0.079	0.052	0.101	0.011	0.032	0.019	0.024	0.000
Sum	599.1	607.2	580.6	532.2	1073.3	487.8	531.4	757.848
Sum Sq. Dev.	4.371	2.545	2.749	87.212	22.359	19.547	23.556	7.844
Obs.	83	83	83	83	83	83	83	83

Table 1. Summary statistics of the stock market indices.

All data is transformed into natural logarithm prior to analysis. In order to examine the linkages among these stock markets, this study uses stock price indices on a monthly basis to avoid distortions common in weekly and daily data arising from non-trading and non-synchronous trading. In this way it is also possible to obtain a clearer picture of movements of indices away from short term fluctuations. The sample period for this study spans from May 2002 to March 2009 (i.e. 83 observations). Following the common practice, all indices are expressed in respective local currency to evade problems associated with transformation due to fluctuations in cross-country exchange rates and also to avoid the restrictive assumption the relative purchasing power parity holds. Since the sample includes monthly data, in order to eliminate the effect of seasonal fluctuations, all series are seasonally adjusted prior to analysis by using ratio to moving average method.

Descriptive statistics are given on Table 1 (above). It is seen from the table that the sample stock indices are not normally distributed, which is verified with the Jarque – Bera statistic. Average value of Turkey and Iran's stock indices are quite high compared to others. Egypt stock market has largest standard deviation, while Iran's has the lowest (among developing markets). Overall deviations of developed markets are quite low in comparison with developing markets. On the other hand, only the Iranian stock market has an excess kurtosis (> 3).

Table 2 shows the pair-wise correlations between the indices under investigation during the observed period. The followings can be deduced: Generally, the correlations are high, which is a preliminary evident for the existence of interdependency among the various markets. It is remarkable that the Tehran stock exchange shows low correlations in comparison with all other markets. The developed markets seem quite highly correlated with each other.

	FR	UK	US	EGY	TUR	JOR	LEB	IR
FR	1.000							
UK	0.992	1.000			_			
US	0.953	0.957	1.000					
EGY	0.791	0.836	0.784	1.000				
TUR	0.875	0.904	0.866	0.969	1.000			
JOR	0.752	0.790	0.755	0.939	0.914	1.000		
LEB	0.704	0.746	0.635	0.922	0.874	0.865	1.000	
IR	0.395	0.431	0.560	0.652	0.644	0.695	0.449	1.000

Table 2. Pair-wise correlations among stock indices.

#### **6.2.** Empirical Findings

The validity and reliability of the regression relationship require the examination of the trend characteristic of the variables and co-integration test as the presence of unit root processes in the stock indices results in the spurious regression problem. Co-integration tests consist of two steps. At the first step, stationarity properties of the series are examined. To this end, we conducted Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests whether the series are stationary in their level, i.e. I(0). ADF test procedure is most popular technique while PP test is less restrictive and provides an alternative way for checking the stationarity feature of a time series. To determine the appropriate

number of lag length the Akaike Information Criterion (AIC) is employed. However, it would not have made any differences even if we had chosen Schwarz Bayesian Information Criterion (SBIC) because both the AIC and SBIC suggested the same lag length. Table 3 shows the results of the ADF and PP tests. It appears from the table that all series have a unit root in their levels that is they are not stationary. However, after first differencing all of them become stationary.

		ADF			PP	
	lags (k)	$\tau(\rho)$	Р	lags (k)	$\tau(\rho)$	Р
FR	1	0.7670 _	0.8227	4		0.8016
UK	0	- 0.6303	0.8571	3	- 0.8310	0.8047
US	1	- 1.1026	0.7115	4	- 0.8711	0.7927
EGY	1	- 1.9454	0.3103	5	- 1.8775	0.3412
TUR	0	- 1.4965	0.5305	3	- 1.4857	0.5359
JOR	1	- 1.5395	0.5087	5	- 1.6737	0.4407
LEB	0	- 1.2467	0.6506	4	- 1.3181	0.6178
IR	1	- 2.6696	0.0838	4	- 2.5812	0.1010
ΔFR	0	- 7.5982	0.0000	1	- 7.5652	0.0000
ΔUK	0	- 7.7836	0.0000	1	- 7.7661	0.0000
ΔUS	0	- 6.8163	0.0000	2	- 6.7395	0.0000
ΔEGY	2	- 3.0727	0.0327	3	- 6.3641	0.0000
ΔTUR	0	- 10.2526	0.0000	3	-10.2039	0.0000
∆JOR	0	- 6.2369	0.0000	3	- 6.3512	0.0000
ΔLEB	0	- 8.1830	0.0000	3	- 8.2605	0.0000
ΔIR	0	- 5.0208	0.0001	2	- 4.9971	0.0001

Table 3. Results of ADF and PP unit root tests.

Once we have found that all series are I(1) the next step is to examine the long-run relationship between these series via co-integration analysis. Co-integration may exist for variables despite variables are individually nonstationary. This means a linear combination of two or more time series can be stationary and there is a long-run equilibrium between them. Thus the regression on the levels of the variables is meaningful and not spurious.

Results of Johansen's co-integration test are presented below (Table 4). From the table, it is evident that the trace statistics and maximum eigenvalue reject the null hypothesis of no co-integration relationship at the 5% level. Therefore, one co-integrating relation ties the movements of all stock indices together in the long run. This implies that international portfolio diversification will be less effective among these five stock markets in the long-run because investment risk cannot be diversified away. This result is partly confirms Marashdeh (2005), in which a significant long-run interdependence has been found among stock markets of Turkey, Egypt and Jordan.

The normalized co-integrating vector on Egypt is reported below. The estimates reveal that the Egypt stock index is negatively related to Iran, Lebanon and Turkey indices but positive long-run relationship is found between Egypt and Jordan indices. Both the standard errors and t-statistics are reported therein, which show all coefficients are statistically significant except of Iran.

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Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.485881	172.4790	159.5297	0.0081
At most 1	0.390459	119.2551	125.6154	0.1144
At most 2	0.275088	79.65109	95.75366	0.3763
At most 3	0.260064	53.91473	69.81889	0.4652
At most 4	0.178546	29.81944	47.85613	0.7281
At most 5	0.106803	14.08514	29.79707	0.8358
At most 6	0.040233	5.049308	15.49471	0.8036
At most 7	0.021810	1.764088	3.841466	0.1841

Unrestricted Co-integration Rank Test (Trace)

Note: \* denotes rejection of the hypothesis at the 0.05 level

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Co-integration equation (normalized on EGY):								
$EGY_{t-1} = 12.42$	$29 - 0.006 IR_{t-1}$	+ 4.607 JOR t-1	- 3.369 LEB t-1 -	1.882 TUR t-1				
Std. error	(0.987)	(1.324)	(1.189)	(1.050)				
t-statistics	[-0.006]	[3.479]	[-2.833]	[-1.792]				

In a set of co-integrated variables, the short term causal relations among these variables should be examined within an error correction model (VECM) framework. For our sample, five-variable VECM can be written as follow:

$$\Delta X_{it} = \Phi_{ij} + \sum_{l=1}^{p} \Phi_{ij,l} \Delta X_{,t-l} + \sum_{m=1}^{4} \sum_{l=1}^{p} \Phi_{i+m,j,l} \Delta X_{i+m,j,t-l} + \delta E C_{t-1} + \varepsilon_{t}$$
  
 $i = 1, 2, ..., 5$ ,  $j = 0, 1, 2, ..., 5$ , and  $t = 1, 2, ..., 83$ 

where  $\Phi_{ij}$  is a constant term and  $\Phi(L)$  is a 5 × 5 polynomial matrix of coefficients to be estimated. *p* is degree of polynomial,  $EC_{t-1}$  is the vector of error correction term which represents the deviations from long-run equilibrium and  $\delta$  represents the response of the dependent variable to departures from equilibrium.  $\varepsilon_t$  is a vector of error term which is white-noise.

Granger (1988) points out that in a VECM there are two channels of causality: one through the lagged values of explanatory variables and the other through the error correction term,  $EC_{t-1}$ . The joint hypothesis of the lags of each variable is tested by the F-statistics and the coefficient of the lagged error term is tested by the t-statistics. Since all indices are co-integrated, the causality among the indices can be tested through both ways. The estimates of VECM and causal relations are given below.

Error Correction	Δ(EGY)	Δ(IR)	Δ(JOR)	Δ(LEB)	∆(TUR)
EC <sub>t</sub>	0.0080	-0.0179 <sup>a</sup>	-0.0014	0.0227 b	0.0258 <sup>b</sup>
$\Delta(EGY_{t-1})$	0.3827 <sup>a</sup>	0.0352	0.2500	<sup>b</sup> 0.1349	0.3210 <sup>b</sup>
$\Delta(EGY_{t-2})$	-0.3010 <sup>b</sup>	0.1211 <sup>c</sup>	0.1056	0.0734	-0.0459
$\Delta(IR_{t-1})$	0.4615	0.3910 <sup>a</sup>	0.0125	0.2855	0.3513
$\Delta(IR_{t-2})$	-0.0736	-0.1901	0.0099	-0.3023	0.2681
$\Delta(\text{JOR}_{t-1})$	-0.1726	0.2205 <sup>b</sup>	0.1179	-0.1013	-0.0356
$\Delta(\text{JOR}_{t-2})$	0.5144 <sup>b</sup>	0.0757	0.1561	0.1994	-0.1417
$\Delta(\text{LEB}_{t-1})$	-0.1373	-0.0681	-0.0748	-0.0974	-0.0345
$\Delta$ (LEB <sub>t-2</sub> )	0.0599	0.0563	-0.0421	0.0385	0.0155
$\Delta(\text{TUR}_{t-1})$	0.0471	-0.0017	-0.0221	0.1787	-0.3102 <sup>b</sup>
$\Delta(TUR_{t-2})$	0.0977	-0.0478	0.0002	0.0002	-0.0565
C	0.0180	0.0011	-0.0009	0.0045	0.0035
R-squared	0.2960	0.4819	0.2557	0.2377	0.2078
F-statistic	2.5987	5.7505	2.1234	1.9273	1.6216
Log likelihood	84.2530	151.2727	109.5511	84.2839	79.1153
Akaike AIC	-1.8063	-3.4818	-2.4388	-1.8071	-1.6779

## Table 5. Vector Error Correction Estimates

Note: a / b / c denotes the significance at 1% / 5% / 10% respectively

Table 6. Variance decompositions

Market	Months	EGY	IR	JOR	LEB	TUR	FR	UK	US
	1	100.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EGY	3	85.21	4.14	1.35	6.40	0.84	0.23	1.75	0.07
	6	71.60	4.11	1.64	18.15	2.13	0.27	1.45	0.65
	9	59.36	3.91	3.38	26.51	2.59	0.43	1.08	2.74
	1	0.75	99.25	0.00	0.00	0.00	0.00	0.00	0.00
	3	1.14	86.03	1.95	0.80	2.07	0.70	1.11	6.20
IK	6	7.44	70.04	1.13	4.07	4.22	0.58	2.80	9.73
	9	8.89	61.59	3.88	6.98	5.10	2.03	2.21	9.32
JOR	1	13.99	1.46	84.54	0.00	0.00	0.00	0.00	0.00
	3	30.77	2.53	51.74	5.92	0.16	1.88	5.98	1.02

Market	Months	EGY	IR	JOR	LEB	TUR	FR	UK	US
	6	34.81	3.18	31.35	22.75	0.10	0.90	6.32	0.59
	9	31.38	3.00	22.75	34.22	0.10	1.16	5.64	1.75
	1	3.58	5.65	2.96	87.81	0.00	0.00	0.00	0.00
LEB	3	12.08	5.24	5.09	74.29	1.91	0.46	0.84	0.08
	6	33.94	3.57	8.14	48.73	1.54	1.55	2.29	0.25
	9	39.69	3.76	6.97	40.89	1.19	2.59	2.22	2.70
TUR	1	19.13	0.05	1.78	2.54	76.51	0.00	0.00	0.00
	3	34.61	6.58	2.76	3.44	49.90	2.37	0.11	0.21
	6	33.86	8.35	3.33	14.05	36.57	2.26	0.11	1.46
	9	29.49	8.80	4.43	21.96	29.33	1.80	0.15	4.04

Results of the pair-wise Granger causality test are given in Table 7. It is evident from the table that there are bidirectional causalities between Egypt – Jordan, Egypt – Turkey, and Lebanon – Jordan. The most related market is of Egypt. On the other hand the most influential developed market is of USA. duly.

 Table 7. F-values of pair-wise Granger causality test (up to 12 lags).

	EGY	IR	JOR	LEB	TUR	FR	UK	US
EGY		1.927 <sup>c</sup>	2.509 <sup>b</sup>	1.454	1.914 <sup>c</sup>	2.577 <sup>b</sup>	1.738 <sup>c</sup>	2.749 <sup>a</sup>
IR	1.092	_	1.666	1.561	0.717	2.238 <sup>b</sup>	1.713 <sup>c</sup>	1.515
JOR	1.806 <sup>c</sup>	1.923°		2.211 <sup>b</sup>	0.942	1.210	1.342	1.453
LEB	1.759 <sup>c</sup>	1.382	2.881 <sup>a</sup>	-	1.499	1.532	1.533	1.074
TUR	1.894 <sup>c</sup>	1.434	0.922	1.833 <sup>c</sup>	_	1.005	0.641	0.818
FR	0.974	0.913	1.542	0.930	1.457	-	1.216	1.944 <sup>c</sup>
UK	1.524	1.539	2.188 <sup>b</sup>	1.509	0.964	1.033		1.224
US	0.944	1.886 <sup>c</sup>	2.182 <sup>b</sup>	1.190	1.267	2.643 <sup>a</sup>	1.703 <sup>c</sup>	_

Note: a / b / c denotes the significance at 1% / 5% / 10% respectively.

Directions of causality: EGY  $\Rightarrow$  IR, EGY  $\Rightarrow$  FR, EGY  $\Rightarrow$  UK, EGY  $\Rightarrow$  US IR  $\Rightarrow$  FR, IR  $\Rightarrow$  UK, JOR  $\Rightarrow$  IR, LEB  $\Rightarrow$  EGY, TUR  $\Rightarrow$  LEB UK  $\Rightarrow$  JOR, US  $\Rightarrow$  IR, US  $\Rightarrow$  JOR, US  $\Rightarrow$  UK EGY  $\Leftrightarrow$  JOR, EGY  $\Leftrightarrow$  TUR, JOR  $\Leftrightarrow$  LEB, FR  $\Leftrightarrow$  US

Next, the impulse response functions (IRFs) are analyzed so that to shed some light on the duration of the effect of shock in stock index to other indices (see at the end of the paper). If the effect of a shock in one of the variables does not die in the long run (even if no further shocks occur), that is, it shifts the system to a new equilibrium, it is called the permanent effect. On the other hand, if the system returns to its previous equilibrium value after some time, it is called the transitory effect (Ratanapakorn, and Sharma 2002). It can be seen from the figures that markets are reactive to shocks in other markets. This implies that all five markets are not so stable. However, Iran stock index leaps out as a bit calmer. On the other hand, other markets are not so reactive to Iran, too.

#### 7. Conclusion

Over the last 15 years, many emerging economies have made significant efforts to strengthen their domestic financial systems, including various segments of the financial market. A wellfunctioning financial market plays a key role in sustained economic growth. Financial markets also facilitate effective implementation of monetary policy by serving as a link in the transmission mechanism between monetary policy and the real economy. In the Middle East region, although financial markets have existed for a long time in some region's countries and there have a huge amount of capital reserve, financial markets of the region remained relatively underdeveloped.

In this paper we aim to investigate financial integration among five emerging stock markets in the Middle East region by using multivariate co-integration technique. In the paper it is also examined that integration between these emerging markets and developed markets represented by US, UK and France. The empirical results show that all stock indices are not stationary in their levels but become stationary after first differencing. This implies all sampled markets are integrated with each other, which means limited diversification opportunities for regional investors. On the other hand the Middle Eastern stock markets promise long-run gains through portfolio diversification for international investors.

As Creane *et al.* (2004) pointed out efforts should be concentrated where financial development appear to have been the weakest. For some countries, this means less involvement of the government in the financial system, including cutting back on public ownership of financial institutions and minimizing monetary financing budget deficits, enhancing competition, investing in human resources, promoting nonbank financial development, and strengthening the legal environment. As foreign participation in these markets continues to increase, the role that these markets play in the world economy would be more important.

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Anexx



# Impulse response functions obtained from unrestricted VAR

# THE INTERPRETATION OF UNIT VALUE INDICES UNIT VALUE INDICES AS PROXIES FOR PRICE INDICES

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#### Abstract

The unit value index (UVI) as compiled in Germany for exports and imports is compared with two other indices, viz. an index of Drobisch which unfortunately is likewise known as 'unit value index' and the 'normal' Laspeyres price index (PI) of exports and imports. The UVI may be viewed as a Paasche index compiled in two stages where unit values instead of prices are used in the low level aggregation stage. Unit values are average prices referring to an aggregate of (more or less homogeneous) commodities. The focus of the paper is on the decomposition of the discrepancy between UVIs and PIs (the 'unit value bias') into a (well known) Laspeyres (or substitution) effect or 'L-effect' and a structural component or 'S-effect' due to substituting unit values for prices. It is shown that amount and sign of S depends on the correlation between the change of quantities of those goods that are included in the aggregate and their respective base period prices. By contrast to L the correlation between quantity and price movement is not relevant for S.

Key words: price index, unit value index, unit values, axioms, foreign trade statistics, Bortkiewicz, Drobisch

JEL Clasification: C43, C80, E01, F10

#### 1. Introduction

Only few countries (among which Germany and Japan) are able to provide on a monthly basis both, a unit value index (UVI) and a true price index (PI) for measuring the price development in export and import. This offers the opportunity to study empirically the impact of the methodological differences between these two indices (Silver 2007, Silver 2008, von der Lippe 2007b).<sup>1</sup> These differences and in particular some considerable shortcomings of UVIs gave rise to concerns as they are internationally much more common and can be viewed only as an unsatisfactory surrogate of PIs.

The problem with UVIs is, however that the term is used for quite different indices. On the one hand there are indices actually compiled in official statistics as for example the German export and import<sup>2</sup> UVIs where unit values as a sort of average prices (for a *group* of goods) take the part prices of individual goods have in the case of a price index (which thus uses data on a much more disaggregated level). On the other hand the term UVI is also in use for an index that should preferably be called 'Drobisch's index', and which is of theoretical interest only<sup>3</sup> because this index requires the calculation of a total unit value of all goods (and maybe also services) at two points in time, 0 (base period) and 1 (present period). Most of the literature to be found under the key word 'unit value index' is dealing with the UVI in the sense of Drobisch's index. This applies for example to Balk 1994, 1998, 2005 and Diewert 1995, 2004.

Section 2 of the paper aims at making clear some properties of unit values and the difference between the above mentioned indices. In Section 3 a decomposition of the 'discrepancy' between a Paasche UVI and the 'normal' Laspeyres PI is derived. It introduced two components of the discrepancy, a 'Laspeyres' or substitution effect (henceforth 'L-effect') and a 'structural' or 'S-effect' respectively. While the former is already well known and sufficiently understood it was a challenge to give in Sections 3 and 4 an interpretation to the S-effect which is apparently closely related to the heterogeneity of the aggregate underlying the calculation of unit values. In Section 4 a covariance is found as a determinant of the S-effect. Section 5 concludes. In the annex we give some information concerning the German official statistics as well as our empirical study.

<sup>&</sup>lt;sup>1</sup> Some of the hypotheses examined in this research as well as conceptual and empirical differences between customs-based UVIs as opposed to survey-based price indices (PIs) are described in the annex.

<sup>&</sup>lt;sup>2</sup> The method of a UVI is also quite common in the case of indices of wages or prices for certain services (air transport for example).

<sup>&</sup>lt;sup>3</sup> Both indices are also quite different as regards their axiomatic performance.

## 2. Unit value index and Drobisch's index

## 2.1. Definition and some properties of unit values

It is important to realize that unit values are defined only for several goods grouped together in a sub collection of goods defined by a classification of products (e.g. of commodities for production or for foreign trade statistics). The relevant unit of the classification is called 'commodity number' (CN) and the unit value is a kind of average price of the  $n_k$  goods in the  $k^{th}$  CN (k = 1, ..., K)

$$\widetilde{p}_{kt} = \frac{\sum_{j} p_{kjt} q_{kjt}}{\sum_{j} q_{kjt}} = \sum_{j=1}^{n_k} p_{kjt} \frac{q_{kjt}}{Q_{kt}} = \sum_{j=1} p_{kjt} m_{kjt} \quad \text{in periods } t = 0, 1$$
(1)

where the summation takes place over the  $j = 1, ..., n_k$  ( $n_k < n$ ) goods of a CN and refers to periods 0 (base period), or 1 (reference period) respectively. In general only in the case of a commodity number

(CN), like the k-th CN sums  $Q_{k0} = \sum_{j=1}^{n_k} q_{kj0}$  or  $Q_{kt} = \sum q_{kjt}$  of quantities have a meaningful interpretation. As a consequence of the definition a number of observations concerning unit values can be made:

1. If all  $n_k$  prices in t are equal  $p_{kjt} = \overline{p}_{kt}$  ( $\forall j = 1,...,n_k$ ) the unit value coincides with the unweighted arithmetic mean irrespective of the quantities

$$\widetilde{\mathbf{p}}_{\mathrm{kt}} = \overline{\mathbf{p}}_{\mathrm{kt}} \,. \tag{1a}$$

2. If all of quantities are equal  $q_{kjt} = q_{kt}$  eq. 1a holds and also

$$Q_{kt} = n_k q_{kt}.$$
 (2)

3. From eq. 1 follows that unit values violate proportionality. If all  $n_k$  individual prices change  $\lambda$ -fold ( $p_{kj1} = \lambda p_{kj0} \forall j$ ) the unit value as a rule does not change  $\lambda$ -fold provided the quantity-structure coefficients m change

$$\widetilde{p}_{k1} = \sum \lambda p_{kj0} m_{kj1} = \lambda \sum p_{kj0} m_{kj1} \neq \lambda \widetilde{p}_{k0} = \lambda \sum p_{kj0} m_{kj0}$$
(3)

and due to

$$\frac{\widetilde{p}_{k1}}{\widetilde{p}_{k0}} = \frac{Q_{k1}}{Q_{k1}} \sum_{j} \frac{p_{kj0}}{p_{kj0}} \left( \frac{p_{kj0}q_{kj1}}{\sum_{j} p_{kj0}q_{kj0}} \right) = \sum_{j} \frac{p_{kj1}}{p_{kj0}} \left( \frac{p_{kj0}m_{kj1}}{\sum_{j} p_{kj0}m_{kj0}} \right)$$
(3a)

the situation  $p_{kj1} = \lambda p_{kj0}$  results in  $\frac{\widetilde{p}_{k1}}{\widetilde{p}_{k0}} = \sum_{j} \lambda \left( \frac{p_{kj0} m_{kj1}}{\sum_{j} p_{kj0} m_{kj0}} \right) \neq \lambda$  because the weights (in brackets) do

not add up to unity (unless  $m_{kj1} = m_{kj0}$  for all k and j).<sup>4</sup>

**4.** From eq. 3a follows that the ratio of unit values  $\tilde{p}_{k1}/\tilde{p}_{k0}$  is *not* a mean value of price relatives<sup>5</sup>  $p_{kj1}/p_{kj0}$  as the weights are  $p_{kj0}m_{kj1} = p_{kj0}q_{kj1}/\tilde{p}_{k0}Q_{k1}$  and summing up to

<sup>&</sup>lt;sup>4</sup> As violation of proportionality implies identity (the special case of  $\lambda = 1$ ) this means that unit values may indicate rising or declining prices although all prices remain constant.

<sup>&</sup>lt;sup>5</sup> It therefore may also violate the mean value property. This also applies to Drobisch's index.

$$\sum_{j} \frac{p_{kj0} q_{kj1}}{\widetilde{p}_{k0} Q_{k1}} = \frac{Q_{k0}}{Q_{k1}} \cdot Q_{01}^{L(k)} = \frac{Q_{01}^{L(k)}}{\widetilde{Q}_{01}^{k}} = S_{01}^{k}.$$
(4)

where  $Q_{0t}^{L(k)}$  is the Laspeyres quantity index of the k<sup>th</sup> CN. When no price changes within each CN we get

$$\widetilde{\mathbf{p}}_{k1}/\widetilde{\mathbf{p}}_{k0} = \mathbf{Q}_{01}^{\mathrm{L}(k)}/\widetilde{\mathbf{Q}}_{01}^{k} = \mathbf{S}_{01}^{k}$$
(4a)

for each k instead of the general formula

$$\tilde{p}_{k1}/\tilde{p}_{k0} = V_{01}^k/\tilde{Q}_{01}^k$$
 (4b)

where  $V_{01}^{k} = \sum_{j} p_{kjl} q_{kjl} / \sum_{j} p_{kj0} q_{kj0}$  the value ratio (index) of the k<sup>th</sup> CN

5. In a similar vein we conclude: if the quantity structure (m-coefficients) within each CN remains constant we get  $^{6}$ 

$$Q_{01}^{L(k)} = \frac{Q_{k1} \sum_{j} p_{kj0} m_{kj1}}{Q_{k0} \sum_{j} p_{kj0} m_{kj0}}$$
(5)

 $(\text{using } m_{kj1} = m_{kj0})$ 

$$= \frac{\mathbf{Q}_{k1}}{\mathbf{Q}_{k0}} = \widetilde{\mathbf{Q}}_{01}^k.$$

6. Unit values violate commensurability which is due to the fact that  $Q_{kt}$  is affected from changes in the quantity units to which the price quotations refer. It can easily be seen what happens when the quantity to which prices of a good in the k-th CN, say i refer changes. Assume prices refer to pounds (in both periods 0 and 1) rather than to kilogram, then

$$\widetilde{Q}_{01}^{*k} = \frac{Q_{k1}^{(i)} + 2q_{kil}}{Q_{k0}^{(i)} + 2q_{ki0}} \neq \widetilde{Q}_{01}^{k} = \frac{Q_{k1}^{(i)} + q_{kil}}{Q_{k0}^{(i)} + q_{ki0}}$$
(6)

where  $Q_{kt}^{(i)}$  denotes the sum over the quantities of all goods in the CN except for i. Hence the  $\tilde{p}_{k1}/\tilde{p}_{k0}$  does not remain unchanged due to the denominator  $\tilde{Q}_{01}^k$  in eq. 4b.

# 2.2. Drobisch's index

The index defined by

$$P_{01}^{UD} = \frac{\sum_{k} \sum_{j} p_{kjl} q_{kjl} / \sum_{k} \sum_{j} q_{kjl}}{\sum_{k} \sum_{j} p_{kj0} q_{kj0} / \sum_{k} \sum_{j} q_{kj0}} = \frac{Q_0}{Q_t} \frac{\sum_{k} \sum_{j} p_{kjl} q_{kjl}}{\sum_{k} \sum_{j} p_{kj0} q_{kj0}} = \frac{V_{01}}{Q_1 / Q_0} = \frac{\widetilde{p}_1}{\widetilde{p}_0}$$
(7)

is unfortunately more often than not called 'unit value index'<sup>7</sup> although it is quite different from an index defined by eq. 8 (the index  $PU^P$  instead of  $P^{UD}$ ) which is also called 'unit value index'. To avoid

<sup>&</sup>lt;sup>6</sup> Equation 5 is equivalent to the absence of the so called S-effect and will gain importance in section 3.3.

<sup>&</sup>lt;sup>7</sup> See also the contribution of Ludwig von Auer in this journal. It is a pity that due to this terminology the purely theoretic  $P^{UD}$  may easily be confounded with the "unit value index"  $PU^P$  as it is in actual fact compiled in practice and will be introduced shortly in sec. 2.3. Silver (2007, 2008) presents empirical findings concerning "unit value indices" which can only be  $PU^P$  indices and at the same time the formula of eq.7 (that is  $P^{UD}$ ) as definition of the "unit value index".

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confusion and this ambiguity the index P<sup>UD</sup> should better be called 'Drobisch's index' as it was being proposed by Drobisch (1871).<sup>8</sup>

It should be noted, however, that it is in general not possible - let alone meaningful - to summate over the quantities of all  $n = \Sigma n_k$  commodities, as required in the compilation of 'Drobisch's' index. Hence unlike the K terms  $O_{kt}$  the term  $Q_t = \sum_k \sum_j q_{kjt} = \sum_k Q_{kt}$  that is  $Q_0$  or  $Q_1$  respectively is in

general not defined. Drobisch's index therefore is interesting only from a theoretical point of view. It is *not* compiled in the practice of official statistics.<sup>9</sup>

Moreover the index  $\vec{P}^{UD}$  can *not* be viewed as being aggregated over 'low level' unit value ratios  $\tilde{p}_{k1}/\tilde{p}_{k0}$  because

$$P_{01}^{UD} = \sum_{k} \frac{\widetilde{p}_{k1}}{\widetilde{p}_{k0}} \left( \frac{\widetilde{p}_{k0} M_{k1}}{\sum_{k} \widetilde{p}_{k0} M_{k0}} \right) \text{ where } M_{kt} = Q_{kt} / \sum_{k} Q_{kt} = Q_{kt} / Q_{t}$$
(7a)

shows that Drobisch's index  $P^{UD}$  (unlike the unit value index  $PU^P$  introduced in Section 2.3) is not a mean value of unit value ratios in the same way as the value index is not a mean of price relatives because the weights (in brackets) do not add up to unity (unless for all k holds  $M_{k1} = M_{k0}$ ). Hence Drobisch's index not only reflects changes within CNs (via  $\tilde{p}_{k1}/\tilde{p}_{k0}$ ) but also between CNs.

### 2.3. Unit value indices (UVI) and price indices (PIs) in official statistics

The 'unit value' index as in actual fact calculated in official statistics of some countries differs from eq. 7 in that unit values are established only for CNs. There are no 'total' or all-items unit values  $\tilde{p}_1$  and  $\tilde{p}_0$  involved i UVIs (as opposed to Drobisch's index).

UVIs are *necessarily* compiled *in two steps*, in the first unit values  $\tilde{p}_{k1}$  and  $\tilde{p}_{k0}$  (instead of prices) are calculated and in the second they - or ratios of them that is  $\tilde{p}_{k1}/\tilde{p}_{k0}$  - are incorporated in the Paasche price index formula

$$PU_{01}^{P} = \sum_{k} \frac{\tilde{p}_{k1}}{\tilde{p}_{k0}} \frac{\tilde{p}_{k0}Q_{k1}}{\sum_{k}\tilde{p}_{k0}Q_{k1}} = \frac{\sum_{k}\tilde{p}_{k1}Q_{k1}}{\sum_{k}\tilde{p}_{k0}Q_{k1}}.$$
(8)

In contrast to Drobisch's index, this index is evidently a weighted arithmetic average of unit value ratios  $\tilde{p}_{k1}/\tilde{p}_{k0}$ . There is of course no obvious reason why the Paasche formula should be preferred to the Laspeyres formula  $PU_{01}^{L} = \sum \tilde{p}_{k1}Q_{k0}/\sum \tilde{p}_{k0}Q_{k0}$  which would be equally useful.

In a unit value index for the measurement of *prices*, that is in PU indices quantities act as weights. It is also possible to measure the dynamics of *quantities* on the basis of sums of quantities  $Q_{kt}$  which then gives QU-indices and where unit values consequently take the part of weights. So for example

$$QU_{01}^{L} = \frac{\sum Q_{k1} \widetilde{p}_{k0}}{\sum Q_{k0} \widetilde{p}_{k0}}$$
(8a)

<sup>&</sup>lt;sup>8</sup> The label "Drobisch's index" is, however, uncommon which is possibly due to the fact that it is already in use for another index also advocated by Moritz Wilhelm Drobisch (1802 – 1894), viz. the *arithmetic* mean of a Laspeyres and a Paasche price index. For more details concerning his index  $P^{UD}$  (eq. 7) see also the contribution of von Auer who, however, does not mention the "unit value index" of official statistics, that eq. 8.

<sup>&</sup>lt;sup>9</sup> The same applies to what might be called the corresponding "unit value" (or Drobisch's) *quantity* index defined by  $\Sigma_i q_{i1}/\Sigma_j q_{i0}$  mentioned for example in the contribution of Diewert.

is a unit value quantity index of the Laspeyres type.<sup>10</sup> Of the many possible variants of PU and QU indices respectively, in what follows we focus on two indices only, viz.  $PU_{01}^{P}$  and  $QU_{01}^{L}$ .

Unit value indices of the type PU may be viewed as two-stage or two-level index compilations where in the first (low) level use is made of unit values rather than prices. There are, however, some differences to the usual notion of 'low level' aggregation which applies to situations in which no information about quantities is available, and therefore no weights can be established (unlike the upper level for which the introduction of weights is characteristic), Moreover in low-level aggregation prices usually are referring to the same commodity in different outlets. Here (and also in the case of using scanner data for the purposes of price statistics) quantities are known and unit values refer to different commodities grouped together by a classification.

In order to make unit value indices (UVIs) and the corresponding 'true' price indices (PIs) comparable we make in what follows the assumption - unrealistic though<sup>11</sup> - that a price index is comprising all K CNs with all  $n = \Sigma n_k$  commodities. We then get

$$P_{0t}^{L} = \frac{\sum_{i=1}^{n} p_{it} q_{i0}}{\sum_{i=1}^{n} p_{i0} q_{i0}} = \frac{\sum_{k=1}^{K} \sum_{j=1}^{n_{k}} p_{kjt} q_{k0}}{\sum_{k=1}^{K} \sum_{j=1}^{n_{k}} p_{kj0} q_{kj0}} = \frac{\sum_{k=1}^{K} \sum_{j=1}^{n_{k}} p_{kjt} q_{kj0}}{\sum_{k=1}^{K} \widetilde{p}_{k0} Q_{k0}}$$
(9)

for the Laspeyres price index.

# 2.4. Unit value index and Drobisch's index

From the observations concerning properties of (ratios of) unit values in Section 2.1 and eq. 9 it easily follows that indices  $U_{01} = U(...)$  that is Drobisch's index  $P_{01}^{UD}$  and the unit value index (in our terminology)  $PU_{0t}^{P}$  (or  $PU_{0t}^{L}$ ) have the following axiomatic properties in common:

a. axioms not satisfied Proportionality (and identity by implication)  $U(\mathbf{p}_0, \lambda \mathbf{p}_0, \mathbf{q}_0, \mathbf{q}_1) = \lambda$ Commensurability  $U(\Lambda \mathbf{p}_0, \Lambda \mathbf{p}_1, \Lambda^{-1}\mathbf{q}_0, \Lambda^{-1}\mathbf{q}_1) = U(\mathbf{p}_0, \mathbf{p}_1, \mathbf{q}_0, \mathbf{q}_1)$ Mean value property  $\min(\mathbf{p}_{i1}/\mathbf{p}_{i0}) \le U_{01} \le \max(\mathbf{p}_{i1}/\mathbf{p}_{i0})$ b. axioms satisfied Linear homogeneity  $U(\mathbf{p}_0, \lambda \mathbf{p}_1, \mathbf{q}_0, \mathbf{q}_1) = \lambda U(\mathbf{p}_0, \mathbf{p}_1, \mathbf{q}_0, \mathbf{q}_1)$ Additivity (in current period prices)  $U(\mathbf{p}_0, \mathbf{p}_1^*, \mathbf{q}_0, \mathbf{q}_1) = U(\mathbf{p}_0, \mathbf{p}_1, \mathbf{q}_0, \mathbf{q}_1) + U(\mathbf{p}_0, \mathbf{p}_1^+, \mathbf{q}_0, \mathbf{q}_1)$  for  $\mathbf{p}_1^* = \mathbf{p}_1 + \mathbf{p}_1^+$ , Additivity (in base period prices)  $[U(\mathbf{p}_0^*, \mathbf{p}_1, \mathbf{q}_0, \mathbf{q}_1)]^{-1} = [U(\mathbf{p}_0, \mathbf{p}_1, \mathbf{q}_0, \mathbf{q}_1)]^{-1} + [U(\mathbf{p}_0^+, \mathbf{p}_1, \mathbf{q}_0, \mathbf{q}_1)]^{-1}$  for  $\mathbf{p}_0^* = \mathbf{p}_0 + \mathbf{p}_0^+$ 

On the other hand there are also some significant differences.

1. while Drobisch's index meets transitivity the unit value index does not

2. as  $P_{01}^{UP} \cdot \widetilde{Q}_{01} = V_{01}$  (product test, or weak factor reversibility, see eq. 8) the factor (index)

 $\widetilde{Q}_{01} = Q_1/Q_0 = \sum_k Q_{k1} / \sum_k Q_{k0}$  is sometimes called 'unit value quantity index' (better: Drobisch's quantity index)<sup>12</sup>; the corresponding relation concerning the PU and QU indices is given in the quite important eq. 10 below.

<sup>&</sup>lt;sup>10</sup> Note that this differs from the "unit value quantity index" (better Drobisch's quantity index)  $\Sigma_k Q_{k1} / \Sigma_k Q_{k0}$  as mentioned in the preceding footnote.

<sup>&</sup>lt;sup>11</sup> Strictly speaking the assumption is not justified, however, because price indices are based on a sample survey whereas unit value indices are resulting from a comprehensive customs statistics. This inaccuracy may be acceptable because our focus is on the formal aspects of the differences between the two types of indices. In addition to the coverage there are many more conceptual and methodological differences between UVIs and PIs for example in German foreign trade statistics. In the annex we try to give an account of the differences and the empirical findings as regards their consequences.

<sup>&</sup>lt;sup>12</sup> See footnote 9.

3. As to the time reversal test the product of  $P_{01}^{UD} = \tilde{p}_1/\tilde{p}_0$  and  $P_{10}^{UD} = \tilde{p}_0/\tilde{p}_1$  is unity and we have (similar to the 'normal' price and quantity indices)  $PU_{01}^LPU_{10}^P = PU_{01}^PPU_{10}^L = 1$ .

4. As will be seen later it is possible that although  $P_{01}^{L} = P_{01}^{P} = PU_{10}^{P} = 1$  holds<sup>13</sup> Drobisch's index  $P_{01}^{UD}$  may differ from unity because  $P_{01}^{UD}$  is affected from changes in the M<sub>kt</sub> terms (eq. 7a) between (rather than within) CNs.

Such differences in the axiomatic properties reinforce once more the need of making a clear distinction between the two types of indices, Drobisch's index and the unit value index (e.g. of Paasche).

### 3. Unit value index and price index

**3.1. Decomposition of the discrepancy between unit value index and price index** The basis of the following decomposition is

$$\mathbf{V}_{01} = \mathbf{P}\mathbf{U}_{01}^{\mathrm{L}}\mathbf{Q}\mathbf{U}_{01}^{\mathrm{P}} = \mathbf{P}\mathbf{U}_{01}^{\mathrm{P}}\mathbf{Q}\mathbf{U}_{01}^{\mathrm{L}} = \sum \mathbf{p}_{1}\mathbf{q}_{1} / \sum \mathbf{p}_{0}\mathbf{q}_{0}$$
(10)

a relationship patterned after the well known identity

$$\mathbf{V}_{0} = \mathbf{P}_{01}^{\mathrm{L}} \mathbf{Q}_{01}^{\mathrm{P}} = \mathbf{P}_{01}^{\mathrm{P}} \mathbf{Q}_{01}^{\mathrm{L}} \,. \tag{10a}$$

In combination with the formula of Ladislaus von Bortkiewicz<sup>14</sup> for the covariance between price and quantity relatives weighted with expenditure shares  $p_0q_0/\Sigma p_0q_0$ 

$$C = Q_{01}^{L} \left( P_{01}^{P} - P_{01}^{L} \right)$$
(11)

due to the fact that

$$C = \sum_{i} \left( \frac{p_{i1}}{p_{i0}} - P_{01}^{L} \right) \left( \frac{q_{i1}}{q_{i0}} - Q_{01}^{L} \right) \frac{p_{i0}q_{i0}}{\sum p_{i0}q_{i0}} = V_{01} - Q_{01}^{L}P_{01}^{L} = Q_{01}^{L}P_{01}^{P} - Q_{01}^{L}P_{01}^{L}$$
(11a)

using eq. 11 leads to the following multiplicative decomposition of the discrepancy D

$$D = \frac{PU_{01}^{P}}{P_{01}^{L}} = \left(\frac{C}{Q_{01}^{L}P_{01}^{L}} + 1\right)\left(\frac{Q_{01}^{L}}{QU_{01}^{L}}\right) = \frac{P_{01}^{P}}{P_{01}^{L}} \cdot \frac{PU_{01}^{P}}{P_{01}^{P}} = L \cdot S.$$
(12)

D has two components or distinct 'effects' which may work in the same or in opposite direction, so that they may be positively or negatively correlated.

The term L is referred to as Laspeyres- or simply *L-effect* reflecting the fact that  $P^P \neq P^L$ . The theorem of L. von Bortkiewicz in eq. 11a states in essence that it is the covariance C that determines sign and amount of the L-effect. A negative covariance ( $P^P < P^L$ ) may arise from rational substitution among goods in response to price changes on a given (negatively sloped) demand curve. The less frequent case of a positive covariance is supposed to take place when the demand curve is shifting away from the origin (due to an increase of income for example).

L is since long a well known and well understood effect, much in contrast to the second component of the discrepancy which will henceforth be called structural component (or *S-effect* for short). It refers to changing quantities within a group of goods k = 1,...,K (for which unit values are established). S is related to the composition ('structure') of the CNs.

<sup>&</sup>lt;sup>13</sup> That is a situation where no price changed and the *structure* of quantities *within* the K CNs remain constant (that is where both, L and S effect – introduces later – are absent) and y

<sup>&</sup>lt;sup>14</sup> This is a special case of the more general theorem of Bortkiewicz we are going to refer to in sec. 4.1.

Both effects, L and S can be expressed in terms of quantity indices as well as in terms of price indices

$$L = \frac{C}{Q_{01}^{L} P_{01}^{L}} + 1 = \frac{Q_{01}^{P}}{Q_{01}^{L}} = \frac{P_{01}^{P}}{P_{01}^{L}}$$
(12a)

$$S = \frac{Q_{01}^{L}}{QU_{01}^{L}} = \frac{PU_{01}^{P}}{P_{01}^{P}}$$
(12b)

The distinction between L and S springs from the fact that it is difficult to compare  $P^{L}$  to  $PU^{P}$  directly. It is useful to divide the comparison into two parts: we compare  $P^{L}$  to  $P^{P}$  on the basis of L, and  $P^{P}$  to  $PU^{P}$  on the basis of S. In general both effects, S and L respectively, will coexist. It is also possible that either or both effects vanish (the latter situation is L = S = 1 and  $PU^{P} = P^{P} = P^{L}$ ).

Table 1 displays various inequalities which can easily be inferred from a closer inspection of eqs. 12a and 12b. In quadrants I and III the effects S and L are working in the same direction (in which case we can combine two inequalities), generating thereby D > 1, or D < 1. By contrast in quadrants II and IV they take the opposite direction so that the sign of D-1 is indeterminate.

	L < 1 (C < 0)	L = 1 (C = 0)	L > 1 (C > 0)
S > 1	II: D is indefinite	$PU^{P} > P^{L} = P^{P}$	$\underline{\mathbf{I}}: \mathbf{PU}^{\mathbf{P}} > \mathbf{P}^{\mathbf{P}} > \mathbf{P}^{\mathbf{L}} \Longrightarrow \mathbf{D} > 1$
S = 1	$PU^P = P^P < P^L$	$PU^{P} = P^{P} = P^{L}$	$PU^P = P^P > P^L$
S < 1	$\underline{\mathbf{III:}} \mathbf{PU}^{\mathbf{P}} < \mathbf{P}^{\mathbf{P}} < \mathbf{P}^{\mathbf{L}} \Longrightarrow \mathbf{D} < 1$	$PU^P < P^L = P^P$	IV: D is indefinite

Table 1

Our empirical study revealed that the most frequently observed case is quadrant III where both effects are negative and reinforce each other to yield  $PU^P < P^P < P^L$  (or equivalently  $Q^P < Q^L < QU^L$ ).

## 3.2. How individual commodities contribute to the L-effect

It is useful to study the covariance (as the decisive term in L) broken down to the level of individual commodities i = 1, ..., n. The formula

$$L = \sum_{i=1}^{n} L_{i} = \sum_{i=1}^{n} \left( \frac{p_{i1}/p_{i0}}{P_{01}^{L}} \right) \left( \frac{q_{i1}/q_{i0}}{Q_{01}^{L}} \right) \frac{p_{i0}q_{i0}}{\sum p_{i0}q_{i0}} = 1 + \frac{C}{P_{01}^{L}Q_{01}^{L}}$$
(13)

where  $C/P_{01}^{L}Q_{01}^{L}$  is a sort of a 'centred' covariance (divided by the respective means), relates individual price and quantity relatives to L and thus shows how a single good contributes to a the L-effect.<sup>15</sup>

$$L_{i} = \left(\frac{p_{i1}/p_{i0}}{P_{01}^{L}}\frac{q_{i1}/q_{i0}}{Q_{01}^{L}}\right)\frac{p_{i0}q_{i0}}{\sum p_{i0}q_{i0}} = \left(\frac{p_{i1}}{P_{01}^{L}}\frac{q_{i1}}{Q_{01}^{L}}\right)\frac{1}{\sum p_{i0}q_{i0}}$$
(13a)

follows that below average price relatives  $p_{i1}/p_{i0} < P_{01}^{L}$  and/or below average quantity relatives  $q_{i1}/q_{i0} < Q_{01}^{L}$  contribute to a 'negative L-effect' (that is L - 1 < 0).<sup>16</sup> Moreover eq. 13 also shows that the L-effect will disappear (L = 1) when one or more of the following conditions apply:

• all price relatives are equal  $p_{i1}/p_{i0} = P_{01}^{L}$  or unity (no price changes)  $p_{i1}/p_{i0} = P_{01}^{L} = 1$  (in which case C = 0 because  $P_{01}^{L} = P_{01}^{P}$ );

<sup>&</sup>lt;sup>15</sup> In sec. 4.1 we try to find a similar equation in order to explain the S-effect.

<sup>&</sup>lt;sup>16</sup> The "negative" effect is empirically more frequently observed.

- the same applies mutatis mutandis to quantity relatives (C also vanishes when  $Q_{01}^{L} = Q_{01}^{P}$ );
- the covariance C between price and quantity relatives disappears.<sup>17</sup>

We start our attempts to derive formulas for S in the next section by showing in quite the same manner under which conditions the S-effect will vanish (or equivalently S = 1).

### 3.2. How individual commodities contribute to the S-effect

A formula useful to explain the contribution of the k-th CN (not the i-th commodity) to S is

$$\mathbf{S} = \frac{\mathbf{Q}_{01}^{L}}{\mathbf{Q}\mathbf{U}_{01}^{L}} = \sum_{k} \frac{\mathbf{Q}_{01}^{L(k)}}{\widetilde{\mathbf{Q}}_{01}^{k}} \cdot \frac{\mathbf{Q}_{01}^{k} \mathbf{s}_{k0}}{\sum_{k} \widetilde{\mathbf{Q}}_{01}^{k} \mathbf{s}_{k0}} = \sum_{k} \mathbf{S}_{01}^{k} \cdot \frac{\widetilde{\mathbf{p}}_{k0} \mathbf{Q}_{k1}}{\sum_{k} \widetilde{\mathbf{p}}_{k0} \mathbf{Q}_{k1}}$$
(14)

with expenditure shares  $s_{k0} = Q_{k0} \tilde{p}_{k0} / \sum_k Q_{k0} \tilde{p}_{k0} = \sum_j p_{kj0} q_{kj0} / \sum_k \sum_j p_{kj0} q_{kj0}$  because

$$QU_{01}^{L} = \sum_{k} \widetilde{Q}_{0}^{k} s_{k0}$$

$$\tag{14a}$$

and

$$Q_{01}^{L} = \sum_{k} Q_{01}^{L(k)} s_{k0} \,. \tag{14b}$$

Weights equivalent to  $\tilde{p}_{k0}Q_{k1}/\sum_{k}\tilde{p}_{k0}Q_{k1}$  in (14) are  $\tilde{Q}_{01}^{k}v_{0}^{k}/\sum_{k}\tilde{Q}_{01}^{k}v_{0}^{k}$  where

$$\mathbf{v}_0^k = \sum\nolimits_j p_{kj0} q_{kj0}$$

Our aim therefore will be to explain the the ratios  $Q_{01}^{L(k)}/\widetilde{Q}_{01}^{k}$  we encountered already in eq. 4, and which are reflecting the contributions of the K CNs to S. This will be done in Section 4.1.

It should be noted, however, right at the outset that the structural effect owes its existence to the two-stage compilation of the unit-value index (UVI). If summation would take in one stage over the individual commodities (not grouped into CNs) the S-effect would disappear.<sup>18</sup> An equivalent condition is (for all k)  $n_k = 1$  (or perfectly homogenous CNs), or  $p_{kjt} = p_{kt} = \tilde{p}_{kt} q_{kjt} = q_{kt}$ ,  $m_{kj1} = 0$ 

$$m_{kj0} = 1 \text{ yielding } PU_{01}^{P} = \frac{\sum_{k} \widetilde{p}_{k1} Q_{k1}}{\sum_{k} \widetilde{p}_{k0} Q_{k1}} = \frac{\sum_{k} p_{k1} q_{k1}}{\sum_{k} p_{k0} q_{k1}} = P_{01}^{P} \text{ using eq. 8.}$$

The S-effect will also vanish (S = 1) if one or more of the following conditions is given

- 1. for all  $j = 1, ..., n_k$  holds  $m_{kj1} = m_{kj0}$  (no structural change within a CN), or
- 2. all  $n_k$  base period prices of a CN k are equal  $p_{kj0} = \tilde{p}_{k0} \quad \forall j = 1,...,n_k$

3. all quantities change at the same rate  $\lambda$  so that  $q_{kjl}/q_{kj0} = Q_{0l}^{L(k)} = \widetilde{Q}_{0l}^{k} = \lambda$  for all j and k, or more specific, they remain constant ( $\lambda = 1$ ).

Furthermore given 1 and 3, and constant prices, that is a situation without both, L and S effect and therefore  $P_{01}^{L} = P_{01}^{P} = PU_{10}^{P} = 1$  it is still possible that  $P_{01}^{UD} \neq 1$  as above mentioned already.

**Statement 1**. follows from  $S = PU_{01}^{P}/P_{01}^{P}$  (eq. 12b) and

<sup>&</sup>lt;sup>17</sup> The theorem of Bortkiewicz shows that for the L-effect to exist it is essential that price and quantity relatives are correlated.

<sup>&</sup>lt;sup>18</sup> Unlike the L-effect the S effect only exists when commodities are grouped together in CNs. There can be no S-effect when there is no heterogeneity and/or structural change within the CNs. It appears therefore sensible to study the S-effect by examining the situation *within* the CNs.

$$PU_{01}^{P} = \sum_{k} P_{01}^{P(k)} \frac{Q_{k1} \sum_{j} p_{kj0} m_{kj1}}{\sum_{k} Q_{k1} \sum_{j} p_{kj0} m_{kj0}}$$
(14c)

as compared to

$$P_{01}^{P} = \sum_{k} P_{01}^{P(k)} \frac{Q_{k1} \sum_{j} p_{kj0} m_{kj1}}{\sum_{k} Q_{k1} \sum_{j} p_{kj0} m_{kj1}}$$

so that assuming  $m_{kj1} = m_{kj0}$  for all j and k gives  $P_{0t}^{P} = PU_{0t}^{P}$  and thus S = 1. Likewise statement 1 can also be derived from (14) and (5) and from  $S = Q_{0t}^{L}/QU_{0t}^{L}$  amounting to

$$S = \frac{Q_{01}^{L}}{QU_{01}^{L}} = \frac{\sum_{k} Q_{k1} \sum_{j} m_{kj1} p_{kj0}}{\sum_{k} Q_{k1} \sum_{j} m_{kj0} p_{kj0}} = \frac{A}{B}$$
(15)

 $(Q_{01}^{L} = A/C \text{ and } QU_{01}^{L} = B/C \text{ have the same denominator } C = \sum_{k} Q_{k0} \sum_{j} m_{kj0} p_{kj0} \text{ and}$ different numerators A and B respectively) such that  $m_{kj1} = m_{kj0}$  entails A = B.

Statement 2. follows from the definitions of the terms  $Q_{01}^{L(k)}$  and  $\widetilde{Q}_{01}^{k}$  used in eq. 14 and from

$$\widetilde{Q}_{01}^{k} = \sum_{j} \frac{q_{kj1}}{q_{kj0}} \frac{q_{kj0}}{\sum_{j} q_{kj0}} = \sum_{j} \frac{q_{kj1}}{q_{kj0}} \cdot m_{kj0}$$
(16)

and

$$Q_{01}^{L(k)} = \sum_{j} \frac{q_{kjl}}{q_{kj0}} \frac{q_{kj0} p_{kj0}}{\sum_{j} q_{kj0} p_{kj0}} = \sum_{j} \frac{q_{kjl}}{q_{kj0}} \cdot s_{kj0} .$$
(16a)

where  $s_{kj0} = q_{kj0} p_{kj0} / \sum q_{kj0} p_{kj0}$  and  $m_{kj0} = q_{kj0} / \sum q_{kj0}$ .

Equal prices in 0 lead to equality of quantity (m) and expenditure (s) weights  $m_{kj0} = s_{kj0}$ , or equivalently  $Q_{01}^{L(k)} = \widetilde{Q}_{01}^{k}$ .

Comparing (16) and (16a) also shows that, what matters is the base period price structure. As

$$\frac{s_{kj0}}{m_{kj0}} = \frac{p_{kj0}}{\widetilde{p}_{k0}}$$
(17)

holds by definition a commodity j with an above average price  $p_{kj0} > \tilde{p}_{k0}$  tends to contribute positively to the S-effect (or in other words, to  $S = Q_{0t}^L/QU_{0t}^L > 1$ ), and correspondingly a below average price contributes negatively to the S-effect (or to S < 1).

**Statement 3.** is obvious as in this case  $Q_{01}^{L(k)} = \widetilde{Q}_{01}^k = \lambda$  so that S = 1. Using  $S = PU_{0t}^P/P_{0t}^P = 1$ , (7) and (10a) we see that under such restricted conditions the unit value index coincides with Drobisch's index  $PU_{0t}^P = P_{0t}^{UD} = P_{0t}^P$ .

Table 2 summarizes some special conditions under which no S effect or no L effect will arise.

Table 2		
	L - effect	S - effect
perfectly homogeneous CNs (or $n_k = 1$ )	not affected	vanishes: $S = 1$
all quantities within the CNs change at the same rate $\lambda$ (also no quantity changes $\lambda = 1$ for all j and k)	vanishes: $L = 1$	S = 1
all prices change at the same rate $\omega$ (also no price changes $\omega = 1$ for all j and k)	L = 1	not affected $S = PU^{P}/P^{P}$ (if $\omega = 1 S = PU^{P}$ )
constant structure of quantities within each CN ( $m_{kjt} = m_{kj0}$ )	not affected	S = 1
equal prices in 0 (all $n_k$ prices $p_{ki0}$ are equal)	not affected	S = 1

In a situation in which the L-effect is vanishing, for example when all prices rise at the same rate  $\omega$  (or in particular  $\omega = 1$ ) S specializes to  $S = PU_{01}^{P}/\omega$ , (or  $S = PU_{01}^{P}$  respectively). Unlike the L-effect the S-effect is possible even though no price is changing.<sup>19</sup> The reason is that according to our observation 4 in Section 2.1  $\tilde{p}_{k1}/\tilde{p}_{k0}$  may well differ from 1 although all individual prices remain constant.

On the other hand, when S vanishes, for example because all prices of a CN in 0 are equal,  $L = Q_{01}^P / Q_{01}^L$  does not vanish but only reduces to  $L = Q_{01}^P / \widetilde{Q}_{01}$  (since in this case  $Q_{01}^L = \widetilde{Q}_{01}$ ).

# 4. Interpretation to the S-effect

#### 4.1. A covariance expression for the S-effect

We now try to explain the K terms  $S_{01}^k = Q_{01}^{L(k)} / \widetilde{Q}_{01}^k$  in eq. 14, introducing K covariances between (the structure of) base period prices and quantity relatives. The 'within-CN' indices  $Q_{01}^{L(k)}$ and  $\widetilde{Q}_{01}^k$  are not only two different ways of measuring the development of quantities in the k<sup>th</sup> CN, they are also *linear* quantity indices. We therefore can again make use of Bortkiewicz's reasoning. According to the *generalized* theorem of Bortkiewicz for two linear indices<sup>20</sup> the ratio X<sub>1</sub>/X<sub>0</sub> of two linear indices

$$X_{1} = \frac{\sum x_{1}y_{1}}{\sum x_{0}y_{1}}$$
(18)

and

$$X_{0} = \frac{\sum x_{1} y_{0}}{\sum x_{0} y_{0}}$$
(18a)

is given by  $\frac{X_1}{X_0} = 1 + \frac{c_{xy}}{\overline{X} \cdot \overline{Y}}$  with the covariance

$$\mathbf{c}_{xy} = \sum \left(\frac{\mathbf{x}_{t}}{\mathbf{x}_{0}} - \overline{\mathbf{X}}\right) \left(\frac{\mathbf{y}_{1}}{\mathbf{y}_{0}} - \overline{\mathbf{Y}}\right) \mathbf{w}_{0} = \frac{\sum \mathbf{x}_{1} \mathbf{y}_{1}}{\sum \mathbf{x}_{0} \mathbf{y}_{0}} - \overline{\mathbf{X}} \cdot \overline{\mathbf{Y}}$$
(19)

and weights  $w_0 = x_0 y_0 / \sum x_0 y_0$ . The mean of the  $x_1/x_0$  terms is with these weights  $\overline{X} = X_0$ ,  $\sum y_0 x_0$ 

however, 
$$\overline{Y} = \frac{\sum y_1 x_0}{\sum y_0 x_0} \neq X_1$$

Note that the theorem does not allow comparing any two indices for example

$$\begin{split} X_{1} &= PU_{01}^{P} = \frac{\sum_{k} \widetilde{p}_{k1} Q_{k1}}{\sum_{k} \widetilde{p}_{k0} Q_{k1}} \text{ where } \widetilde{p}_{k1} = y_{1}, \widetilde{p}_{k0} = y_{0}, Q_{k1} = x_{1} \text{ cannot be compared with} \\ P_{01}^{UD} &= \frac{\sum_{k} \widetilde{p}_{k1} \left(\frac{Q_{k1}}{Q_{1}}\right)}{\sum_{k} \widetilde{p}_{k0} \left(\frac{Q_{k0}}{Q_{0}}\right)} = \frac{\sum_{k} \widetilde{p}_{k1} M_{k1}}{\sum_{k} \widetilde{p}_{k0} M_{k0}}, \end{split}$$

because this ratio cannot be written as a  $X_0$  - term (according to eq. 18a) corresponding to  $X_1$  as defined above.

<sup>&</sup>lt;sup>19</sup> Therefore in the example of sec. 4.3  $\omega = 1$  (L = 1) is assumed to demonstrate the S-effect taken in isolation.

<sup>&</sup>lt;sup>20</sup> See von der Lippe (2007), pp. 194 – 196. Eq. 11a is only the special case of  $X_0 = P^L$  and  $X_1 = P^P$ .

To compare, however, the terms  $X_1 = Q_{01}^{L(k)}$  and  $X_0 = \widetilde{Q}_{01}^k$  in  $S_{01}^k = Q_{01}^{L(k)} / \widetilde{Q}_{01}^k$  requires to make the assumptions  $x_0 = q_0$ ,  $x_1 = q_1$ ,  $y_0 = 1$ ,  $y_1 = p_0 w_0 = q_0 / \Sigma q_0$  leading to  $X_1 = Q_{01}^{L(k)}$ ,  $\overline{X} = X_1 = X_0 = \widetilde{Q}_{01}^k$  and  $\overline{Y} = \widetilde{p}_{k0}$ . The resulting covariance then is

$$c_{k} = \sum \left( \frac{q_{kjl}}{q_{kj0}} - \widetilde{Q}_{01}^{k} \right) \left( p_{kj0} - \widetilde{p}_{k0} \right) \frac{q_{kj0}}{\sum q_{kj0}} = \sum \left( \frac{q_{kjl}}{q_{kj0}} - \widetilde{Q}_{01}^{k} \right) \left( p_{kj0} - \widetilde{p}_{k0} \right) m_{kj0}$$
$$= \frac{\sum_{j} q_{kj1} p_{kj0}}{\sum_{j} q_{kj0}} - \widetilde{p}_{k0} \widetilde{Q}_{01}^{k} = \widetilde{p}_{k0} \left( Q_{01}^{L(k)} - \widetilde{Q}_{01}^{k} \right)$$
(using (1)). (20)

It can easily be verified that in fact  $\frac{X_1}{X_0} = 1 + \frac{c_k}{\overline{X} \cdot \overline{Y}} = 1 + \frac{\widetilde{p}_{k0} \left( Q_{01}^{L(k)} - \widetilde{Q}_{01}^k \right)}{\widetilde{p}_{k0} \widetilde{Q}_{0t}^k} = \frac{Q_{01}^{L(k)}}{\widetilde{Q}_{01}^k} = S_{01}^k.^{21}$ 

Eq. 20 tells us, that a commodity j tends to raise (lower)  $S = Q_{01}^L/QU_{01}^L$  as a weighted sum of  $S_{01}^k = Q_{01}^{L(k)}/\widetilde{Q}_{01}^k$  whenever the covariance is positive (negative) and the commodity j has a non-negligible weight given by the share  $m_{kj0} = q_{kj0}/\Sigma q_{kj0}$  of the total quantity at the base period. If quantities of goods with above average prices ( $p_{kj0} > \widetilde{p}_{k0}$ ) in the base period tend to rise to an extent below average ( $q_{kjt}/q_{kj0} < \widetilde{Q}_{0t}^k$ ) the covariance will be negative and S tends to be less than unity (in short:  $c_k < 0 \rightarrow S < 1$ ). A negative covariance  $c_k < 0$  also ensues from an above average rise of quantities of those goods where base period prices were below average. Correspondingly one may infer:  $c_k > 0 \rightarrow S_{01}^k > 1 \rightarrow S > 1$ .

Due to eq. 14  $S_{01}^k$  and thereby the covariance  $c_k$  will contribute more or less to S depending on the somewhat hybrid weights  $\tilde{p}_{k0}Q_{k1}/\sum_k \tilde{p}_{k0}Q_{k1}$ .

Another way of defining  $X_t$  and  $X_0$  ( $x_0 = q_0$ ,  $x_t = q_1$ ,  $y_0 = p_0$ ,  $y_t = 1$   $w_0 = p_0q_0/\Sigma p_0q_0$ ) leads to

$$\begin{aligned} \varepsilon_{k}^{*} &= \sum \left( \frac{q_{kj1}}{q_{kj0}} - Q_{01}^{L(k)} \right) \left( \frac{1}{p_{kj0}} - \frac{1}{\widetilde{p}_{k0}} \right) \frac{p_{kj0}q_{kj0}}{\sum p_{kj0}q_{kj0}} \\ &= \frac{\sum_{j} q_{kjt}}{\sum_{j} p_{kj0}q_{kj0}} - Q_{01}^{L(k)} \cdot \frac{1}{\widetilde{p}_{k0}} = \left( \widetilde{p}_{k0} \right)^{-1} \left( \widetilde{Q}_{01}^{k} - Q_{01}^{L(k)} \right) \end{aligned}$$
(21)

using weights  $s_{kj0} = p_{kj0}q_{kj0}/\Sigma p_{kj0}q_{kj0}$  rather than  $m_{kj0} = q_{kj0}/\Sigma q_{kj0}$ . However,  $c_k^*$  explains  $1/S_{01}^k = Q_{01}^{L(k)}/\widetilde{Q}_{01}^k$  the k-th CN contribution to  $S^{-1} = QU_{01}^L/Q_{01}^L$  instead of S, since

$$\frac{X_1}{X_0} = 1 + \frac{c_k^*}{\overline{X} \cdot \overline{Y}} = 1 + \frac{(\widetilde{p}_{k0})^{-1} (\widetilde{Q}_{01}^k - Q_{01}^{L(k)})}{(\widetilde{p}_{k0})^{-1} Q_{01}^{L(k)}} = \frac{\widetilde{Q}_{01}^k}{Q_{01}^{L(k)}}$$

 $S^{-1} \text{ is a weighted sum of these terms with weights given by } Q_{0t}^{L(k)} s_{k0} / \sum_k Q_{0t}^{L(k)} s_{k0} \text{ instead of } \widetilde{p}_{k0} Q_{k1} / \sum_k \widetilde{p}_{k0} Q_{k1} = \widetilde{Q}_{01}^k s_{k0} / \sum_k \widetilde{Q}_{01}^k s_{k0} \text{ .}$ 

<sup>&</sup>lt;sup>21</sup> It was only when I presented this paper at the Meeting of the Ottawa Group in Neuchâtel that I became aware of the fact that G. Párniczky (1974) had already mentioned  $c_k$  in his (largely unknown) paper dating back to 1974. Moreover, he did so with explicit reference to Bortkiewicz. However, he tried to explain Drobisch's index  $P^{UD}$  rather than  $PU^P$ . Also the combination of S and L-effect was not his concern. Unlike our exposition his was in need of making a distinction between "within-group" and "between-group" covariances. Finally we do not agree with his main result "that disaggregation in general is not likely to improve the accuracy of the unit value index" (he also used in the sense of Drobisch's index). This is clearly at odds with the conventional wisdom that splitting CNs into smaller (and thus more homogeneous) CNs will in general tend to reduce the S-effect.

Both covariances have their specific merits and demerits. From eq. 20 and 21 follows

$$\widetilde{\mathbf{p}}_{k0} \right)^2 \mathbf{c}_k^* = -\mathbf{c}_k \,. \tag{22}$$

Thus the covariances necessarily have different signs. The covariance  $c_k$  is useful because it relates to S rather than S<sup>-1</sup>, however, on the other hand  $c_k^*$  can more readily be compared to the covariance C responsible for the L-effect, in which according to eq. 11a also use is made of weights  $s_{ki0}$  rather than  $m_{kj0}$ .

Table 3 provides a synopsis of all  $2^3 = 8$  possible situations concerning L and S and the covariances C (eq. 11a) and  $c_k^*$  (eq. 21)<sup>22</sup> depending on whether

- 1. quantity relatives are above  $(q_{kit}/q_{kj0} > Q_{0t}^{L(k)})$ , labelled QR +), or below average (QR -)
- 2. price relatives are above ( $p_{kit}/p_{ki0} > P_{0t}^{L(k)}, PR$  +), or below average (PR -)
- 3. base period prices are above  $(p_{ki0} > \tilde{p}_{k0}, P_0 +)$ , or below average  $(P_0 -)$ .

Our empirical study<sup>23</sup> reached the conclusion that L < 1 and S < 1 seems to be the most frequent combination. Situations in which this takes place are highlighted in table 3.

#### Table 3

#### L- effect and S- effect depending on two covariances

	price relatives <b>PR</b> +		price relatives <b>PR</b> -		
	<b>P</b> <sub>0</sub> +	P <sub>0</sub> -	P <sub>0</sub> +	P <sub>0</sub> -	
	$C > 0 \rightarrow L > 1$		$C < 0 \rightarrow L < 1$	$C < 0 \rightarrow L < 1$	
QR+	$c_k^* < 0 \rightarrow S > 1$	$c_k^* > 0 \rightarrow S < 1$	$c_k^* < 0 \rightarrow S > 1$	$c_k^* > 0 \rightarrow S < 1$	
	$C < 0 \rightarrow L < 1$	$C < 0 \rightarrow L < 1$	C > 0 -	$\rightarrow$ L > 1	
QR -	$\mathbf{c}_k^* > 0 \rightarrow \mathbf{S} < 1$	$c_k^* < 0 \rightarrow S > 1$	$\mathbf{c}_{k}^{*} > 0 \rightarrow \mathbf{S} < 1$	$\mathbf{c}_{k}^{*} < 0 \rightarrow \mathbf{S} > 1$	

#### 4.2. A simplified situation to study the determinants of S

Assume only two commodities in one CN only (so  $n_j = 1$ , K = 1, and we therefore simply drop the subscript k in what follows), equal quantity shares  $m_{10} = m_{20} = \frac{1}{2}$  in the base period,  $p_{10} = p$ , and  $p_{20} = \lambda p$ . Further  $\mu = m_{21}/m_{20} = m_{21}/0.5 = 2m_{21}$  measures the change in the quantity share of commodity 2 ( $m_{11} = 1-\mu/2$  because  $m_{21} = \mu/2$ , and  $0 \le \mu \le 2$ ).

In order to bring  $L \neq 1$  into the play prices have got to change and they should change at a different rate. So denote the price relative of good 1 by  $\pi = p_{11}/p_{10}$  and let  $p_{21}/p_{20} = \eta(p_{11}/p_{10}) = \eta\pi$  be the price relative of the second good. In order to study the special situation with no L-effect (L = 1) where prices remain constant simply assume  $\eta = \pi = 1$ .

In the general  $(L \neq 1)$  as well as the special (L = 1) case we get  $QU_{01}^{P} = QU_{01}^{L} = \widetilde{Q}_{01}$ . This result and  $PU_{01}^{P} = PU_{01}^{L}$  is due to the fact that we assumed K = 1 (only one CN) in which case also Drobisch's index  $P_{01}^{UD}$  is equal to  $PU_{01}^{P}$ .

Table 4 (part a) summarizes the results.

Part b of table 4 shows that economically rational behaviour, that is the situations II and IV in which the unit value is declining ( $\Delta < 0$  although prices remained constant) will also lead to a negative S-effect (S < 1). Once changing prices are considered L < 1 will also ensue from this kind of behaviour. It is therefore not surprising that empirical evidence seems to support the expectation that most frequently both 'effects', L and S operate in the same direction and will predominantly be negative. It should be borne in mind, however, that the conclusions are derived only under most

<sup>&</sup>lt;sup>22</sup> For conditions concerning  $c_k$  (of eq. 20) you simply have to change > to < and vice versa.

<sup>&</sup>lt;sup>23</sup> For details see the Annex.

restrictive assumptions (no price changes, only one CN), and they may well be no longer tenable under more general conditions.

	general case	special case (no change of prices $\eta = \pi = 1$ )
$\widetilde{p}_0$	(p/2)(1+	$(\lambda)$
$\widetilde{p}_1$	$(p/2)\pi(2-\mu+\mu\eta\lambda)$	$(p/2)(2-\mu+\mu\lambda)$
$\widetilde{p}_1$ - $\widetilde{p}_0$	$= \Delta^* = (p/2) [\pi (2 - \mu (1 - \eta \lambda)) - (1 + \lambda))]$	$= \Delta = (p/2)(1-\lambda)(1-\mu)^{a}$
$\mathbf{P}_{01}^{\mathrm{L}}$	$\pi(1+\eta\lambda)/(1+\lambda)$	1
P <sub>01</sub> <sup>P</sup>	$\pi(2-\mu+\eta\lambda\mu)/(2-\mu+\lambda\mu)$	1
$L = P_{01}^{P} / P_{01}^{L}$	$\frac{2-\mu+\eta\lambda\mu}{1+\eta\lambda}\cdot\frac{1+\lambda}{2-\mu+\lambda\mu}$ $=(2-\mu+\eta\lambda\mu)/(1+\eta\lambda)S$	1
C (covariance) <sup>b)</sup>	$2\widetilde{Q}_{0t}\lambda\pi(1-\mu)(1-\eta)/(1+\lambda)^2$	$0 (as \eta = 1)$
V <sub>01</sub>	$\pi \widetilde{Q}_{01}(2-\mu+\mu\eta\lambda)/(1+\lambda)$	$= \mathbf{Q}_{01}^{\mathrm{L}} = \widetilde{\mathbf{Q}}_{01} \mathbf{P} \mathbf{U}_{01}^{\mathrm{P}} = \widetilde{\mathbf{Q}}_{01} \mathbf{S}$
D = LS	$\frac{PU_{0t}^{P}}{P_{0t}^{L}} = \frac{2 - \mu(1 - \eta\lambda)}{1 + \eta\lambda}$	$\frac{2-\mu+\mu\lambda}{1+\lambda} = S$
$PU_{01}^{P} = PU_{01}^{L}$	$\pi (2 - \mu + \eta \lambda \mu) / (1 + \lambda) = S \cdot P_{0t}^{P}$	$(2-\mu+\mu\lambda)/(1+\lambda) = S (as P_{01}^{P}=1)$
$Q_{01}^P$	$\widetilde{Q}_{01}(2-\mu+\eta\mu\lambda)/(1+\eta\lambda)$	$\widetilde{Q}_{01}(2-\mu+\mu\lambda)/(1+\lambda) = Q_{01}^{L}$
$Q_{01}^L$	$\widetilde{Q}_{01}(2-\mu+\mu\lambda)/(1+\lambda)$	
$QU_{01}^{P} = QU_{01}^{L}$	$QU_{01}^{P} = QU_{01}^{L} = \widetilde{Q}_{01}$	
covariance $c_k^{\ c)}$	$\sum_{j} \left( \frac{q_{j1}}{q_{j0}} - \widetilde{Q}_{01} \right) \left( p_{j0} - \widetilde{p}_{0} \right) \frac{q_{j0}}{\sum q_{j0}} = \widetilde{Q}_{01} \frac{p}{2}$	$[(1-\lambda)(1-\mu)] = \widetilde{Q}_{01}\Delta$
c <sup>*</sup> <sub>k</sub>	$\widetilde{Q}_{01}(\lambda-1)(1-\mu)/p(1+\lambda)^2/2 = -\Delta/(\widetilde{p}_0)^2$	2
$S = Q_{01}^L \big/ \widetilde{Q}_{01}$	$\frac{2-\mu+\mu\lambda}{1+\lambda} = 1 + \frac{(1-\lambda)(1-\mu)}{1+\lambda} = 1 + \frac{2\Delta}{p(1+\lambda)}$	$\frac{1}{\lambda} = 1 + \frac{\Delta}{\widetilde{p}_0}$

Table 4 (part a)

**a.** note  $\Delta \neq 0$ , although no price changed ( $\eta = \pi = 1$ ) if only  $\lambda \neq 1$  (unequal prices in the base period) and  $\mu \neq 1$  (structural change within the CN) is given;

**b.** C = 0 when the quantity structure has not changed, that is  $m_{21} = \mu/2 = m_{20} = \frac{1}{2}$  or  $\mu = 1$ ;

**c.** there is only one such covariance as K = 1;

d. obviously neither  $\eta$  nor  $\pi$  is relevant for the covariances  $c_k$  and  $c_k^*$  which explain the S-effect.

		$\mu < 1$ (less of good 2)		$\mu > 1$ (more of good 2)
$\lambda > 1$	II	$\lambda > 1$ and $\mu < 1 \rightarrow \Delta < 0$ less of the more expensive good 2	Ι	$\lambda > 1$ and $\mu > 1 \rightarrow \Delta > 0$ more of the more expansive good 2
expensive		$c_{\rm L} < 0 \rightarrow S < 1$		the more of the more expensive good 2 $c_{\rm L} > 0 \rightarrow S > 1$
λ < 1	III	$\lambda < 1$ and $\mu < 1 \rightarrow \Delta > 0$	IV	$\lambda < 1$ and $\mu > 1 \rightarrow \Delta < 0$
good 2 less		less of the cheaper good 2		more of the cheaper good 2
expensive		$c_k > 0 \rightarrow S > 1$		$c_k < 0 \rightarrow S < 1$

#### 5. Conclusions and final remarks

In Section 4.1 the contribution of an individual CN to S =  $Q_{01}^{L}/QU_{01}^{L}$  (Laspeyres type indicators of quantity movement) was examined. However, S can also be expressed in terms of Paasche type price indicators  $S = PU_{01}^{P} / P_{01}^{P}$ . While  $P_{01}^{P}$  is a weighted mean of the K CN-specific Paasche indices<sup>24</sup>  $P_{0t}^{P(k)}$  unfortunately the index  $PU_{0t}^{P}$  cannot be seen this way.<sup>25</sup> Moreover prices  $p_{kjt}$ 

disappear in the ratio 
$$\frac{PU_{0t}^{P}}{P_{0t}^{P}} = \frac{\sum_{k} p_{kt}Q_{kt}}{\sum_{k} \tilde{p}_{k0}Q_{kt}} \cdot \frac{\sum_{k} \sum_{j} p_{kj0}q_{kjt}}{\sum_{k} \sum_{j} p_{kjt}q_{kjt}} = \frac{\sum_{k} \sum_{j} p_{kj0}q_{kjt}}{\sum_{k} \tilde{p}_{k0}Q_{kt}}$$
 which therefore does

not provide any new insights compared to  $S = Q_{0t}^{L} / QU_{0t}^{L}$ .

It can also be shown that a theory of the structural effect S is much more straightforward if one considers a Paasche type unit value index of the  $PU_{01}^{P}$ . The analogous analysis of the  $PU_{01}^{L}$  type unit value index would be more difficult.

As to the relationship between a unit value index  $(PU_{01}^{P})$  and Drobisch's index  $(P_{01}^{UD})$ , this is not merely a matter of the level of aggregation. Comparing eq. 7a and 8 shows that the unit value index may be viewed as a weighted mean of 'low level' Drobisch indices  $\tilde{p}_{kt}/\tilde{p}_{k0}$  while this is not true for Drobisch's index. Furthermore, as pointed out in this paper, there are many other aspects (for example, the axiomatic properties), which require the two indices to be looked at as two distinct types of price indices.

A clear distinction is also necessary between the S-effect and the L-effect. The L-effect can be viewed as resulting from a substitution between quantities in response to changing prices, and it may be desirable for a price index to reflect this phenomenon. This, however, does not apply to the Seffect, which rather seems to be an unwanted disturbance. Moreover, while prices must be changing for the L-effect to occur, the S-effect is possible even with constant prices, provided only that the structure of quantities is changing.

After all it is difficult to think of a microeconomic theory able to explain the sign of the covariance  $c_k$  as this covariance relates changes in quantities from period 0 to 1 to the structure of base period prices irrespective of prices in period 1, and a change in quantities may even take place although all prices remain constant. Thus the change in quantities cannot be viewed as response to changing prices.

It seems therefore difficult to 'explain' the sort of economic behaviour which gives rise to a negative and a positive covariance  $c_k$  in terms of utility maximizing behaviour ion a similar fashion to the well known microeconomic theoretical underpinning of the L-effect.

In addition to the formal aspects regarding the difference between  $PU^{P}$  and  $P^{L}$  on which this paper focuses, there are many other aspects that should be considered when an assessment of unit value indices has to be made. Although they are standard practice in many countries there are strong reservations about unit value indices for the principal reason that they do not compare like with like; they violate the principle of pure price comparison,  $2^{26}$  and we agree with Silver (2007, 2008) that they may be justified – if at all – only as low-budget proxies for survey-based price indices. The following appendix will present some more details regarding the deficiencies of unit value indices.

<sup>&</sup>lt;sup>24</sup> Insofar analogous to eq. 14b where  $Q^L$  was described as weighted mean of individual  $Q^{L(k)}$  indices. <sup>25</sup> The reason is that the weights in eq. 14c do not add up to unity.

<sup>&</sup>lt;sup>26</sup> This has already been established by the SNA 1993 which states that unit values are "affected by changes in the mix of items as well as by changes in their prices. Unit value indices cannot therefore be expected to provide good measures of average price change over time" (§ 16.13). Interestingly the SNA did not seem to realize that the same argument (no pure price comparison) would apply also to chain indices.

## Appendix

# A1. Formulas of indices of export and import in Germany

Unit values  $\tilde{p}_{kt}$  take the part of prices in both price- and quantity indices; hence we have unit value indices on the level of price and of quantity indices respectively (the latter is less common, however). So in theory at least  $2^4 = 16$  indices exist due to the four dichotomies:

- 1. unit value index (UVI) vs. price index (PI) concept (level of aggregation in price data);
- 2. index describing movement of prices vs. quantities (volumes);
- 3. Laspeyres vs. Paasche formula; and
- 4. prices of exports vs. those of imports.

German official statistics provides Paasche *unit value* indices in addition to genuine Las-peyres type *price* indices (both of export and import respectively). There are also countries in which use is made of both, prices and unit values in the same (price) index.<sup>27</sup>



Figure A.1: The structure of indices on the basis of unit values\*

\*The universe of n commodities is partitioned into K groups (sub-collections) of related commodities; the subscript k = 1, 2, ..., K denotes the number of the group and the subscript j the j<sup>th</sup> commodity of the k<sup>th</sup> group.

#### A2. Data basis (survey based price indices vs. customs based unit value indices)

Unit value indices (UVIs) are based on a complete statistics of customs documents rather than on the observation of a sample of carefully specified goods under comparable conditions. Thus UVIs also refrain from using appropriate methods for adjustments of quality changes, temporary (seasonal) unavailability, or outlier detection and deletion. Moreover there are reasons to expect ever more difficulties in the future as regards customs statistics. We observe an increasing proportion of trade in services rather than in goods that physically cross borders. Likewise e-trade and intra-area trade within customs unions without customs documents on which statistics could be based gain importance. In sum unit value indices are less commendable from a theoretical point of view.

<sup>&</sup>lt;sup>27</sup> According to the Internet Canada is an example. The export/import price index (= International Merchandise Trade Price index IMTPI) makes use of both unit values processed by the International Trade Division (on the basis of customs data) and when unit values are not accurate (heterogeneous aggregates) or unavailable price data provided by other (Canadian and foreign, e.g. the BLS of the USA) sources are taken. Both direct index formulas, Laspeyres and Paasche are used. For internal use also a chained Fisher index is being compiled.

	Price index (PI)	Unit value index (UVI)
Data	Survey based (monthly), sample; more demanding than UVI (empirical weights!)	A by-product of customs statistics, census, in the case of Intrastat* survey
Formula	Laspeyres	Paasche
Prices, aggregates	Prices of specific goods at time of contracting (lead of price index?)	Average value of CNs; time of crossing border (lag of UVI?)
New or dis- appearing goods	Included only with a new base period; vanishing goods replaced by <i>similar</i> ones constant selection of goods *	Immediately included; price quotation of disappearing goods is simply discontinued; variable universe of goods
Quality	Quality adjustment are performed	No quality adjustment (not feasible?)

### Table A.2: Indices of prices in foreign trade (export and import) in Germany

\* intra European Community (or Union)

\*\* All price determining characteristics are deliberately kept constant

By contrast to compile a sample survey based PI is more demanding. It requires special surveys addressing exporting and importing establishments as well as compliance with the principle of 'pure price comparison'. This implies making adjustments (of reported prices) for quality changes in the traded goods or avoiding changes in the collection of goods, reporting firms or in the countries of origin (in the case of imports) or destination involved.

To sum up PIs appears to be theoretically more ambitious and to fit better to the general methodology (and the principle of pure price comparison in particular) of official price statistics whereas UVI might be a low budget 'second best' solution and surrogate for PIs as they are more readily available and less demanding as regards data collection.

# A3. Hypothesis on the basis of the conceptual differences between P and U indices

The conceptual and methodological differences mentioned give rise to testing empirically some hypotheses. In what follows we refer to an unpublished paper the present author has written in cooperation with Jens Mehrhoff (von der Lippe, Mehrhoff (2008)).<sup>28</sup> We studied altogether six hypotheses (see table A.3 summarizing the main results) using German data (Jan. 2000 through Dec. 2007). The hypotheses were quite obvious given the conceptual differences and most of them proved true. Above all UVIs and PIs of export and import respectively differ with regard to their level and volatility. UVIs tend to display a relative to PIs more moderate rise of prices combined with more accentuating oscillations. An altogether smoother pattern of the time series can also be attributed to the process of quality adjustment of PIs whereas UVIs are habitually not adjusted (which is in no small measure also due to the fact that details about the quality of the goods are lacking in customs data). Conspicuously and contrary to our expectations there was no clear evidence for the expected lead of PIs relative to the UVIs.

Table A.3: Summary of tests about differences between unit value indices (U = UVI) and price indices (P = PI)
based on empirical calculations of Jens Mehrhoff

Hypothesis	Argument	Method	Result
1. U < P, growing discrepancy	Laspeyres (P) > Paasche (U) Formula of L. v. Bortkiewicz	Theil's inequality coeff. applied to growth rates of the series	largely confirmed

<sup>&</sup>lt;sup>28</sup> Compared to von der Lippe (2007b) it contains a completely new empirical study (worked out by J. Mehrhoff).

Hypothesis	Argument	Method	Result
<b>2. Volatility</b> U > P	U no pure price comparison (U reflecting changes in product mix [structural changes])	Dispersion (RMSE) of de- trended (HP Filter) series (of P and U in exports and imports)	confirmed <sup>a)</sup>
<b>3. Seasonality</b> U > P	U no adjustment for seasonally non-availability	Standard dev. of seasonal component (Census X- 2ARIMA)	similar to hypothesis no. 2
4. U suffers from heterogeneity	Variable vs. constant selection of goods, CN less homogeneous than specific goods	average correlation (root of mean R <sup>2</sup> ) of subindices (if small heterogeneity)	U only slightly more heterogeneous b)
<b>5. Lead</b> of P against U	Prices refer to the earlier moment of contracting (contract-delivery lag; exchange rates)	Correlation between $\Delta P$ (shifted forward) against $\Delta U$	no systematic pattern <sup>c)</sup>
<b>6. Smoothing</b> in the case of P	Quality adjustment in P results in smoother time series	special data analysis <sup>d)</sup> of the German Stat Office	confirmed

**a.** Hypothesis largely confirmed, P is integrated, U stationary (depending on the level of (dis)aggregation);

- **b.** more pronounced in the case of imports than of exports;
- **c.** in line with Silver's results;

**d.** concerning desktops, notebooks, working storage and hard disks; coefficient of variation was in all cases sizeably smaller after quality adjustment than before.

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# WHEN THE US SNEEZES ROMANIA IS VERY ILL. ECONOMIC CRISIS IN ROMANIA

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#### Abstract

In summer 2007, US and global financial markets found themselves facing a potential financial crisis, and the US Federal Reserve found itself in a difficult situation. It was becoming clear that banks and other financial institutions would ultimately lose tens or even hundreds of billions of dollars from their exposure to subprime mortgage market loans.

On December 1, 2008, the National Bureau of Economic Research (NBER) declared that the United States entered a recession in December 2007. But after a period of protracted adjustment, the US economy, and the world economy more generally, is able to get back to business.

Countries of Central and Eastern Europe have been extremely affected by the crisis, not only because they have suffered a decline in domestic demand and exports, but many of them suffering from the effects of depreciation relative to their foreign currency loans. In addition, access to external credit has been restricted and the costs rose. Finally, capacitive their exit from the crisis on account of public expenditures is extremely limited.

Unfortunately, as seen fairly quickly in early 2009, Romania is not so simple as Western. Romania entered the global slowdown at the end of 2008, about three months after the economic contraction had begun to bite in the West. 2009 was certainly a painful year, with the Romanian economy shrinking by 4%. International Monetary Fund has estimated that the Romanian economy will register a decline of 1.9 percent this year and an increase of 1.5 percent in 2011, says the latest IMF forecast.

Lower wages and pensions, increasing unemployment rate and people unable to pay their maintenance costs and their credits to the banks, this is the picture of Romania after 1st of August 2010, when the austerity measures announced by the government are applied.

Under existing circumstances, in this paper we want to make an analysis of the current economy in Romania and debate the possible settlement to solve this.

Keywords: international financial crisis, global recession, causes and effects of the crisis, anti-crisis remedies, external debt

JEL Classification: E44, F01, G01, G15

#### **1. Introduction**

The financial crisis of 2007–present is a crisis triggered by a liquidity crisis in the United States banking system. It has resulted in the collapse of large financial institutions, the bailout of banks by national governments and downturns in stock markets around the world. In many areas, the housing market has also suffered, resulting in numerous evictions, foreclosures and prolonged vacancies. It is considered by many economists to be the worst financial crisis since the Great Depression of the 1930s. It contributed to the failure of key businesses, declines in consumer wealth estimated in the trillions of US dollars, substantial financial commitments incurred by governments, and a significant decline in economic activity.

Many causes have been proposed, with varying weight assigned by experts. Both market-based and regulatory solutions have been implemented or are under consideration, while significant risks remain for the world economy over the 2010–2011 periods.

The collapse of a global housing bubble, which peaked in the US in 2006, caused the values of securities tied to real estate pricing to plummet thereafter, damaging financial institutions globally. Questions regarding bank solvency, declines in credit availability, and damaged investor confidence had an impact on global stock markets, where securities suffered large losses during late 2008 and early 2009 (Figure 1).



Figure 1. World map showing GDP real growth rates for 2009

Source: CIA World FactBook, 2010

Economies worldwide slowed during this period as credit tightened and international trade declined. Critics argued that credit rating agencies and investors failed to accurately price the risk involved with mortgage-related financial products, and that governments did not adjust their regulatory practices to address 21st century financial markets. Governments and central banks responded with unprecedented fiscal stimulus, monetary policy expansion, and institutional bailouts.

# 2. Financial crisis of 2007–2010. Background and causes

The immediate cause or trigger of the crisis was the bursting of the United States housing bubble which peaked in approximately 2005–2006. High default rates on 'subprime' and adjustable rate mortgages (ARM) began to increase quickly thereafter. An increase in loan packaging, marketing and incentives such as easy initial terms and a long-term trend of rising housing prices had encouraged borrowers to assume difficult mortgages in the belief they would be able to quickly refinance at more favorable terms.

However, once interest rates began to rise and housing prices started to drop moderately in 2006–2007 in many parts of the US refinancing became more difficult. Defaults and foreclosure activity increased dramatically as easy initial terms expired, home prices failed to go up as anticipated, and ARM interest rates reset higher.

Low interest rates and large inflows of foreign funds created easy credit conditions for a number of years prior to the crisis, fueling a housing construction boom and encouraging debt-financed consumption. The combination of easy credit and money inflow contributed to the United States housing bubble. Loans of various types (e.g., mortgage, credit card, and auto) were easy to obtain and consumers assumed an unprecedented debt load. As housing prices declined, major global financial institutions that had borrowed and invested heavily in subprime MBS reported significant losses. Falling prices also resulted in homes worth less than the mortgage loan, providing a financial incentive to enter foreclosure. The ongoing foreclosure epidemic that began in late 2006 in the US continues to drain wealth from consumers and erodes the financial strength of banking institutions. Defaults and losses on other loan types also increased significantly as the crisis expanded from the housing market to other parts of the economy. Total losses are estimated in the trillions of US dollars globally (Figure 2).



Figure 2. Share in GDP of US financial sector since 1860

#### Source: Phillipon, 2008

While the housing and credit bubbles built, a series of factors caused the financial system to both expand and become increasingly fragile, a process called financialization. Policymakers did not recognize the increasingly important role played by financial institutions such as investment banks and hedge funds, also known as the shadow banking system. Some experts believe these institutions had become as important as commercial (depository) banks in providing credit to the US economy, but they were not subject to the same regulations. These institutions as well as certain regulated banks had also assumed significant debt burdens while providing the loans described above and did not have a financial cushion sufficient to absorb large loan defaults or MBS losses. These losses impacted the ability of financial institutions to lend, slowing economic activity. Concerns regarding the stability of key financial institutions drove central banks to provide funds to encourage lending and restore faith in the commercial paper markets, which are integral to funding business operations. Governments also bailed out key financial institutions and implemented economic stimulus programs, assuming significant additional financial commitments.

# 2.1. Sub-prime lending

The term subprime refers to the credit quality of particular borrowers, who have weakened credit histories and a greater risk of loan default than prime borrowers. The value of US subprime mortgages was estimated at \$1.3 trillion as of March 2007, with over 7.5 million first-lien subprime mortgages outstanding.

In addition to easy credit conditions, there is evidence that both government and competitive pressures contributed to an increase in the amount of subprime lending during the years preceding the crisis. Major US investment banks and government sponsored enterprises like Fannie Mae played an important role in the expansion of higher-risk lending.

Subprime mortgages remained below 10% of all mortgage originations until 2004, when they spiked to nearly 20% and remained there through the 2005-2006 peak of the United States housing bubble. A proximate event to this increase was the April 2004 decision by the US Securities and Exchange Commission (SEC) to relax the net capital rule, which permitted the largest five investment banks to dramatically increase their financial leverage and aggressively expand their issuance of mortgage-backed securities. This applied additional competitive pressure to Fannie Mae and Freddie Mac, which further expanded their riskier lending. Subprime mortgage payment delinquency rates remained in the 10-15% range from 1998 to 2006, then began to increase rapidly, rising to 25% by early 2008.

Others have pointed out that there were not enough of these loans made to cause a crisis of this magnitude. In an article in Portfolio Magazine, Michael Lewis spoke with one trader who noted that 'There weren't enough Americans with [bad] credit taking out [bad loans] to satisfy investors' appetite for the end product.' Essentially, investment banks and hedge funds used financial innovation to

enable large wagers to be made, far beyond the actual value of the underlying mortgage loans, using derivatives called credit default swaps and synthetic CDO. As long as derivative buyers could be matched with sellers, the theoretical amount that could be wagered was infinite. 'They were creating [synthetic loans] out of whole cloth. One hundred times over! That's why the losses are so much greater than the loans.'

Economist Paul Krugman argued in January 2010 that the simultaneous growth of the residential and commercial real estate pricing bubbles undermines the case made by those who argue that Fannie Mae, Freddie Mac, CRA or predatory lending were primary causes of the crisis. In other words, bubbles in both markets developed even though only the residential market was affected by these potential causes.

# 2.2. Role of economic forecasting

The financial crisis was not widely predicted by mainstream economists, who instead spoke of The Great Moderation. A number of heterodox economists predicted the crisis, with varying arguments. Dirk Bezemer in his research credits (with supporting argument and estimates of timing) 12 economists with predicting the crisis: Dean Baker (US), Wynne Godley (UK), Fred Harrison (UK), Michael Hudson (US), Eric Janszen (US), Steve Keen (Australia), Jakob Brøchner Madsen and Jens Kjaer Sørensen (Denmark), Kurt Richebächer (US), Nouriel Roubini (US), Peter Schiff (US), and Robert Shiller (US). Examples of other experts who gave indications of a financial crisis have also been given.

A cover story in Business Week magazine claims that economists mostly failed to predict the worst international economic crisis since the Great Depression of 1930s. The Wharton School of the University of Pennsylvania's online business journal examines why economists failed to predict a major global financial crisis. Popular articles published in the mass media have leaded the general public to believe that the majority of economists have failed in their obligation to predict the financial crisis. For example, an article in the New York Times informs that economist Nouriel Roubini warned of such crisis as early as September 2006, and the article goes on to state that the profession of economics is bad at predicting recessions.

Within mainstream financial economics, most believe that financial crises are simply unpredictable, following Eugene Fama's efficient-market hypothesis and the related random-walk hypothesis, which state respectively that markets contain all information about possible future movements, and that the movement of financial prices are random and unpredictable.

# 2.3 Financial markets impacts

The International Monetary Fund estimated that large US and European banks lost more than \$1 trillion on toxic assets and from bad loans from January 2007 to September 2009. These losses are expected to top \$2.8 trillion from 2007-10. US banks losses were forecast to hit \$1 trillion and European bank losses will reach \$1.6 trillion. The IMF estimated that US banks were about 60 percent through their losses, but British and euro zone banks only 40 percent.

During September 2008, the crisis hits its most critical stage. There was the equivalent of a bank run on the money market mutual funds, which frequently invest in commercial paper issued by corporations to fund their operations and payrolls. Withdrawal from money markets was \$144.5 billion during one week, versus \$7.1 billion the week prior. This interrupted the ability of corporations to rollover (replace) their short-term debt. The US government responded by extending insurance for money market accounts analogous to bank deposit insurance via a temporary guarantee and with Federal Reserve programs to purchase commercial paper.

### 3. Global contagion

The crisis rapidly developed and spread into a global economic shock, resulting in a number of European bank failures, declines in various stock indexes, and large reductions in the market value of equities and commodities.

Both MBS and CDO were purchased by corporate and institutional investors globally. Derivatives such as credit default swaps also increased the linkage between large financial institutions. Moreover, the de-leveraging of financial institutions, as assets were sold to pay back obligations that

could not be refinanced in frozen credit markets, further accelerated the solvency crisis and caused a decrease in international trade.

World political leaders, national ministers of finance and central bank directors coordinated their efforts to reduce fears, but the crisis continued. At the end of October 2008 a currency crisis developed, with investors transferring vast capital resources into stronger currencies such as the yen, the dollar and the Swiss franc, leading many emergent economies to seek aid from the International Monetary Fund.

#### **3.1.** Effects on the global economy

A number of commentators have suggested that if the liquidity crisis continues, there could be an extended recession or worse. The continuing development of the crisis has prompted in some quarters fears of a global economic collapse although there are now many cautiously optimistic forecasters in addition to some prominent sources who remain negative.

UBS quantified their expected recession durations on October 16: the Euro zone's would last two quarters, the United States' would last three quarters, and the United Kingdom's would last four quarters. The economic crisis in Iceland involved all three of the country's major banks. Relative to the size of its economy, Iceland's banking collapse is the largest suffered by any country in economic history. For the first quarter of 2009, the annualized rate of decline in GDP was 14.4% in Germany, 15.2% in Japan, 7.4% in the UK, 18% in Latvia, 9.8% in the Euro area and 21.5% for Mexico.

Some developing countries that had seen strong economic growth saw significant slowdowns. For example, growth forecasts in Cambodia show a fall from more than 10% in 2007 to close to zero in 2009, and Kenya may achieve only 3-4% growth in 2009, down from 7% in 2007. According to the research by the Overseas Development Institute, reductions in growth can be attributed to falls in trade, commodity prices, investment and remittances sent from migrant workers (which reached a record \$251 billion in 2007, but have fallen in many countries since). The stark implications and has led to a dramatic rise in the number of households living below the poverty line, be it 300,000 in Bangladesh or 230,000 in Ghana. The Arab world had lost \$3 trillion due to the crisis.

The European Commission at Brussels predicted for 2009 an extremely weak growth of GDP, by 0.1 percent, for the countries of the Euro zone (France, Germany, Italy, etc.) and even negative number for the UK (-1.0 percent), Ireland and Spain, the US Federal Reserve.

### 3.2. Crisis in Europe

Europe had one of the most stable growth rates in the world. The east, in particular, has seen an increase in GDP in recent years. Most countries are growing at a medium speed; however, many smaller countries exceed 7% and grow much faster than their neighbors. Out of the 10 fastest growing countries in the world, one is in Europe.

At the first signs of the financial crisis in the United States it was supposed that the advanced economies of Europe shouldn't be affected, but the real estate markets in some countries (United Kingdom, Ireland, Spain) entered the crisis in 2008, suffering significant losses and triggering panic throughout the financial sector. By the end of 2008, the effects on Europe had expanded both in territory (Germany, France, Sweden, Benelux etc.) and sectors (including housing and automotive industry). The primary capital markets have also entered the crisis, which required the States intervention through nationalization, in whole or in part, of the credit institutions with liquidity problems, spending huge amounts of public money.

Paradoxically, despite the insignificant proportion of toxic assets in their banking system, the emerging countries of Central and Eastern Europe, escaped from an experimental system of command economy and going through a transition to a market economy, have also been exposed to the effects of the crisis, mainly due to their excessive openness to the foreign capital, including the financial one, sometimes of pure speculative nature.

Mid last year, EU had many chances to emerge from recession even before the US, but its «for better or for worse» commitment has hurt developed countries, while less developed ones had levers and funds they could use to jumpstart their economies but they failed to do it. Greece's debt crisis serves to EU and euro are in particular as a «test of resilience» that will not come to an end once with the bailout package: it would backfire on the long-run.
As for Central and Eastern European countries, Poland remains a leader in terms of 'economic crisis management', as it devised a laudable response to financial crisis to bypass the recession that engulfed its peers in the region, while other countries are still reeling from it.



Figure 3. Tracking the fiscal position against previous banking crises

Notes: (1) Based on 49 crises episodes as presented in European Commission (2009c). Unweighted country average. t=start of the crisis

(2) Includes crisis episodes in Bulgaria, Czech Republic, Estonia, Finland, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia, Spain and Sweden. For new Member States data from 1991.

(3) Includes crisis episodes in Finland, Spain and Sweden.

(4) Includes crisis episodes in Finland, Norway, Sweden, Japan and Spain.

(5) Includes crisis episodes in Argentina (2001), Indonesia, Korea, Malaysia (1994), Philippines, Thailand and Turkey (2000).

(6) All EU27 countries, t=2008.

Source: Calculations based on IMF International Financial Statistics and AMECO.

The effects of the crisis on emerging European countries have been multiplied by their super positioning to the persistent inflationary pressures caused by the rise of energy, raw materials and agricultural products global prices, during 2007 until the second half of 2008. Moreover, in this context, a flight of foreign capital has been noticed, some of these countries (Hungary, Romania, Czech Republic, Poland) facing a sharp depreciation of their currencies and the decline of investors appetite, which resulted in an increase in external financial imbalances (Figure 3). Among the emerging European countries, the Baltic countries seem to have been most affected, the international rating agencies having successively degraded their country risk.

#### 4. The Impact of Global Crisis in Romania's Economic Development

Romania suffered its worst recession in at least 20 years in 2009 as booms in construction and commerce collapsed. The recession wiped out gains made in 2008 when the economy grew 7.1 percent, the fastest pace in the European Union, which the country joined in 2007. Shrinking government revenue and pressure on the Romanian money- leu forced the government to turn last April to international lenders for a bailout package (Figure 4).

East European economies have been emerging from recessions in recent quarters although slower-than-expected recoveries, such as the improvement in Romania's \$163 billion economy, indicate the process may be fragile.



Figure 4. Fiscal position for members' states

Source: European Comission

#### 4.1. Some dates about Romania

Romania is a middle income European Union member economy of Central-Eastern Europe. Until 2009, Romanian economic growth was among EU's fastest. Gross domestic product contracted 7.1% in the third quarter of 2009 from the same period a year earlier, and the IMF estimates that the budget deficit will be as high as 7.8% of GDP.

Romania has the 11th largest economy in the European Union by total nominal GDP and the 8th largest based on purchasing power parity and is one of the fastest growing markets in recent history with consistent annual GDP growth rates above 6% (+8.4% for 2008). Romania is a member of the European Union (7th largest country), its most important trading partner. Romania has experienced growth in foreign investment with a cumulative FDI totaling more than \$100 billion since 1989.

Prior to the late 2000s recession, some economic predictions indicated that Romanian GDP will double from 2006 to 2011, and one scholar has even suggested that Romania will overtake Italy in GDP per capita by 2020. Despite a growth rate of 7.1% in 2008, in 2009 the Romanian economy was heavily affected by the global financial downturn and contracted by some -7.2%. The IMF, the European Council, as well as some independent analysts predict that growth will resume in 2010. Future prospects are tied to the country's increasingly important integration with the European Union member states. The country is expected to join the Euro zone no later than 2014.

Since 2000, Romania has attracted increasing amounts of foreign investment, becoming the single largest investment destination in Southeastern and Central Europe.

#### 4.2. The impact of the global crisis on Romania's economy

In the first year of the crisis in Romania -2009- the economic crisis has affected the less important area of economic life: the collapse has started with construction industry and construction material factories, collapse started by the real estate market sinking. Others affected sectors where: insurance, banking and stock exchange and in all the financial sector was strongly shaken down. The consummation has fallen sharply and the Gross Domestic Product has being reduced with 10% in 2010. The decrease in our economy has being so devastating that we are back at the 2000 level. Unfortunately the economic collapse of 2009 and 2010 has put the foundation for a crisis without equivalent in Romanian history that will affect the country in 2011 and 2012.

Public investment looks good on paper, but their practical implementation requires administrative capacity, project managers and consistency in action. Romania faces its first economic crisis since the fall of communism, as its 2008 performance, with a record economic growth of about 9% in the first nine months of 2008, was significantly slowed down by the global financial crisis. European Bank for Reconstruction and Development (EBRD) has reduced its growth forecast for Romania this year from 1.3% to zero, considering that new measures to reduce the budget deficit will limit domestic demand.

## 4.2.1. Inflation Developments

The convergence of inflation towards the medium-term targets and the sustainable recovery of both lending in the Romanian economy and GDP growth are strictly conditional upon all the elements of the macroeconomic policy mix complying with the updated coordinates of the economic programme under the external financing arrangement concluded with the EU, the IMF and other international financial institutions, as well as upon the absence of unforeseen adverse shocks over the forecast horizon.

In August 2010, the 12-month inflation rate remained within the variation band of  $\pm 1$  percentage point around the 3.5 percent annual target, its downward trend coming to a halt. At end-June, the annual inflation rate came in at 4.38 percent (0.18 percentage points above the March reading, Figure 5), due mainly to the faster growth rate of administered prices and to the influence exerted by the domestic currency depreciation trend. Furthermore, the increasing strains on commodity prices on the agri-food market were accompanied by a decline in the financial capacity of both producers and distributors to support promotional product sales.

#### Inflation Developments



**Figure 5. Inflation Developments** 

Source: National Institut of Statistics, National Bank of Romania calculations

The convergence of inflation towards the medium-term targets and the sustainable recovery of both lending in the Romanian economy and GDP growth are strictly conditional upon all the elements of the macroeconomic policy mix complying with the updated coordinates of the economic programme under the external financing arrangement concluded with the EU, the IMF and other international financial institutions, as well as upon the absence of unforeseen adverse shocks over the forecast horizon.

#### 4.2.2. Economic Developments. Demand and supply

In March 2010, real GDP posted a slower rate of decline than in December 2009 (by 3.9 percentage points to -2.6 percent). Behind this performance stood both the five times slower quarterly pace of decrease reported in the considered period and the base effect associated with the contraction by more than 4 percent seen in 2009. Seemingly, the year-on-year contraction was 0.5 percentage points lower than the March benchmark projection. However, the deviation is entirely attributable to the difference between the annual rates calculated on the basis of the unadjusted series and those calculated based on the seasonally adjusted series – envisaged by the forecast. On the demand side, the economic decline moderated due to domestic absorption (-3 percent year on year compared to -9.9

percent in 2009), whereas the positive contribution of net external demand dissipated significantly. On the supply side, the slower economic decrease was supported by services and industry.

The quarter-on-quarter analysis shows (Figure 6) that the slower contraction in real GDP than in 2009 (to -0.3 percent) was mainly accounted for by the cumulative performance of 'changes in inventories' and 'the statistical discrepancy', to which added the influence, albeit of a visibly lower magnitude, of the revival in investment. By contrast, the contributions made by final consumption and net exports of goods and services saw a deterioration given that in march both segments of consumer demand reported trend reversals and the strong acceleration in the dynamics of exports (to +12 percent) was accompanied by the upturn in imports; the joint contribution of these two components entered negative territory, after reporting positive readings for quarters (-0.7 percentage points). On the supply side, except for services, whose quarterly growth rate reported a trend reversal, agriculture and construction continued to follow sharply downward trajectories (-4.3 percent and -5.9 percent respectively), while in industry the gross value added saw a visibly lower decline (to -0.2 percent).



#### **Real Gross Domestic Product**

Figure 6. Real GDP evolution

Source: National Institut of Statistics

The updating of the macroeconomic outlook and parameters of this year's budget execution, carried out in April-May 2010 on the occasion of the joint EU-IMF mission, pointed to the fact that the failure to take corrective measures would translate in an end-2010 budget deficit accounting for 9.1 percent of GDP (against 5.9 percent according to the initial budget planning). In this context, the Romanian authorities announced their intention to implement additional fiscal consolidation measures aimed at fulfilling the newly negotiated target for the consolidated budget deficit: 6.8 percent of GDP.

For this purpose, in June, the government assumed responsibility for two draft laws. The first stipulated the reduction by 25 percent in public sector employees' wages and by 15 percent in the pension point and other social transfers including unemployment benefits. The estimated impact of these two measures on the consolidated budget was 1 percent of GDP each. The second draft law concerned the recalculation of pensions established under special laws with a view to narrowing the gap between the aforementioned pensions and those regulated by Law No. 19/2000 on public pension system and other social security benefits. The initially approved set of austerity measures was amended on 26 June 2010, following the Constitutional Court's decision considering unconstitutional the reduction of the pension point.

In this context, the authorities abandoned this provision and opted for raising the

VAT from 19 percent to 24 percent as of 1 July 2010. Some amendments to the Tax Code were made with the same purpose of increasing other categories of budget revenues. The main changes envisaged the enlargement of the tax base (all types of gains in the nature of interest, luncheon and gift

vouchers, the reduction in the rate of deductible expenditures when establishing net incomes from intellectual property rights, a.s.o.) and the increase in taxes on buildings and means of transport. In addition, new measures have been adopted aiming at reducing current expenditures, chiefly by a 20 percent cut in goods and services expenses of public authorities and institutions, national companies, national corporations, companies with majority or fully state-owned capital and régies autonomes and the decrease in staff costs at local government level.

#### 4.2.3. Labour market

After the peak recorded in 2009, the gap between workforce demand and excess workforce supply narrowed slightly following a relative pick-up in the number of vacancies March through May 2010 and the flattening out of the upward path of registered unemployment. However, the gap was still wide, being indicative of the persistently moderate annual dynamics of wages in the private sector, tendency also bolstered by the expected and actual wage cuts in the public sector. Wage earnings helped ease inflationary pressures in terms of both demand and the impact on ULC in industry, the annual pace of decline being faster than in April-May 2010 (Figure 7).



Source: National Institut of Statistics, National Bank of Romania calculations

The latest statistical data corroborated the market signals (from private recruiting agencies and companies) regarding a slight rebound in labour demand starting with March 2010; apart from the positive influence of seasonal factors, this development was due to the restructuring and the diversification of private companies' activity with a view to their repositioning on viable segments. Accordingly, on the one hand, the number of vacancies as well as that of temporary and permanent employment contracts increased and, on the other hand, total lay-offs continued to decline even though mass dismissals displayed a peak in March-April (especially as a result of staff cuts in certainstate-owned railway transport companies, as well as in mining and energy sectors).

Nevertheless, the level of workforce absorption was well below the level prior to the crisis, while excess workforce kept rising, on a quarterly basis, by around 0.2 percentage points – registered unemployment rate went up to 7.9 percent in the period under review, despite the slight drop in the number of first-time jobless claims and the gradual rise in the number of persons who did not renew their applications to be registered with the NEA after the end of the unemployment benefit period.

The dynamics of real disposable income further acted as a deterrent on household consumption and, implicitly, on CPI inflation rate. Real disposable income fell by 5.8 percent in 2010 compared to a year earlier, on account of a severe contraction in transfers from abroad and wage cuts, while social transfers stepped up by roughly 10 percent, especially following the rise in unemployment benefit expenses. The sign reversal in the annual dynamics of social transfers represented the main explanation behind the annual decline in real disposable income from -14 percent in 2009.

#### 4.2.4. Implications of recent exchange rate and interest rate developments on economic activity

The RON/EUR exchange rate witnessed a trend reversal in April, as the upward movement seen throughout june 2010 (Figure 8) reflected mainly rising concerns generated by the Greek sovereign debt crisis and the risks of ripple effects being sent over to other euro area economies. The exchange rate embarked on a steeper upward path towards the end of the period under review, while daily volatility increased markedly, amid heightened tensions on the political stage and on the domestic financial market triggered by the worsening outlook on budget execution and the additional fiscal consolidation measures taken by the authorities.



#### **Developments of RON Exchange Rate\***

Figure 8. Developments of RON Exchange Rate

Source: National Institut of Statistics, National Bank of Romania

In June 2010, the domestic currency weakened against the euro, thus partially reversing the appreciation tendency seen in the previous quarter. The depreciation of the leu against the US dollar was more significant, reflecting the appreciation of the US dollar against the euro. In this context, the leu depreciated markedly, in terms of nominal effective exchange rate. Given the faster increase of domestic prices than that of external prices, the depreciation of the leu in real effective terms was slightly lower than that in nominal terms. Over June 2010, investor sentiment towards countries facing vulnerabilities associated with future public finances developments worsened sharply and, via expectations regarding the contagion effect, had a negative impact on the movements in exchange rates of regional currencies. Pessimistic expectations concerning the pace of economic recovery in EU Member States contributed to the deterioration in international financial market sentiment as well.

As far as Romania was concerned, the worsening of investor sentiment was related to the uncertainties surrounding the authorities' capability to manage the budget deficit along the coordinates of the loan agreement concluded with the EU, the IMF and other international financial institutions. Moreover, GDP data for 2010 Q1 indicated a deepening of the recession and led to the shaping of negative expectations regarding the developments for the year as a whole. The aforementioned factors contributed to a gradual depreciation of the leu in nominal terms, which became more pronounced at end-June, when the quotations published by the NBR exceeded the historical high recorded in January 2009, amid the uncertainties surrounding the measures to be implemented with a view to ensuring public finance sustainability over the medium term.

The impact of developments in the real effective exchange rate on economic activity is estimated via the net export channel and the wealth and balance sheet effects. As for the net export channel, the leu depreciation in real terms recorded in june 2010 is assessed to expert a stimulative

influence on net exports and, implicitly, on future aggregate demand. By contrast, via the wealth and balance sheet effects, the softer leu will have a restrictive impact on aggregate demand, with higher repayment costs expressed in leu for the loans in foreign currency. In 2010, the cumulative effect of the exchange rate of the leu on future economic activity via these channels is estimated to be stimulative. At the same time, higher quarter-on-quarter readings of the nominal exchange rate contribute, ceteris paribus, to pushing up consumer prices via an increase in import prices.

Over June 2010, interest rates applied by credit institutions to their non-bank clients declined significantly. This adjustment was influenced by the successive cuts in the policy rate in the preceding quarters and the lower interbank market rates.

Consequently, the reductions in nominal lending and deposit rates were transmitted almost entirely to real interest rate dynamics. These developments reveal a relative mitigation of the restrictive effect of interest rates applied by credit institutions to their non-bank clients on future economic activity.

The cumulative effect of the leu exchange rate and interest rates applicable to non-bank clients on future aggregate demand is estimated to be slightly stimulative compared with the 2009, when it was assessed to be neutral.

In September, capital increases might gather some momentum in the industrial sector, solely on the back of developments across manufacturing. In the construction sector, appetite for investment looks set to remain on a downward trend. The profitability ratio is likely to improve slightly against the previous month in the industrial sector, but in the construction sector it will keep shrinking slowly.

The European Bank for Reconstruction and Development (EBRD) has lowered its forecast on Romania's 2010 economic growth to zero from a previous forecast of 1.3%, citing limited internal demand expected after the country's austere budget gap tightening measures. The international financial institution said in a last report Romania has vowed to take drastic measures to tighten its ballooning budget deficit, which will trigger a decline in internal demand.

**In conclusion**, Romania'mid term economic growth will be affected by such crisis effects as lower investments, credit market pressure and rising unemployment, adding to which is the impact of an ageing population and public finance sustainability. It will therefore be of essence for government to step up implementing structural reforms towards ensuring an economic growth potential able to strengthen the sustainability of the public finance system. It is important for Romania to implement pension system reform, as well as the fiscal and structural reforms included in the trade balance balancing program agreed with the European Commission. Further more, Romania needs to take concrete steps to speed up absorption of EU structural funds, given this would allow more investment into long term engines of economic growth without putting budget deficit targets under threat.

The conclusions are clear: the crisis is not over but has entered in a more difficult faze that will affect financial and banking system and economic fundaments. The economic crisis will continue until 2015 at the earliest and a coming back cycle that will last until 2020. This decade will be without a doubt the lost decade of Romania but if the necessary measures are not rapidly taken to re-establish control on economic decline than we risk that Romania will not come back economy not even in 2020

### 5. Concluding Remarks

The crisis has also shown up the EU's long-term economic problems. Our exporters must compete with rivals in China, India and other emerging economies where costs are lower.

2011 will be without a doubt the year of economic turmoil in Romania. First of all the 2011 will be the year that will pay for all the economic collapse of the last years. The financial system will be hard hit and this will make the fragile Romanian economy to reach the breaking point. The inflation will resurface and the experts appreciate that a 10% percent yearly inflation will be unavoidable.

The aging of our population means that fewer Europeans of working age must support a growing number of pensioners. First, to stabilize the economic situation in the long term is needed to identify clearly the real problem that has pushed the world economy at this stage of instability. For Romania:

• despite the negligible effects of the crisis on the banking system of Romania due to the limited exposure to the toxic assets, the measures for promoting the recovery of lending through the recapitalization of banks could help the rebound of the consumption credit support and the prevention of a too long recession.

• the impact of the global crisis which has contracted the external demand particularly affects the real economy. According to the decline in GDP over the first two quarters in 2009 Romania has entered into recession.

• viewing the economy vulnerabilities caused by the accelerated deterioration of the current account in recent years mainly due to the growth of trade deficit, Romania's external financial position was on the edge of a crisis, which, in any way, would have rendered an external loan necessary to cover the financial gap.

• the analytical foundation of the joint loan from the IMF-World Bank-EBRD-EU summing EUR 20 billion over two years is raising debatable assumptions, in our opinion, the real reason being imposed by the NBR needs to avoid a currency crisis, firstly because of the lack of immediate liquidity of international reserves, apparently reassuring.

• besides the negative impact on the Romanian economy, the crisis can stimulate the financial restructuring and reorganization, to develop new activities and gain new markets, taking into account the conditions of competitiveness and globalization, marked by challenges of the environmental crisis and the transition to a sustainable development.

• because of the crisis impact on the state budget by cutting public funds, including for RandD and for environmental protection investments, the government should promote strategies in order to develop high technologies for saving energy, for recycling and waste treatment, while respecting the environment parameters and the requirements of Romania's sustainable development.

• there is a series of other dilemmas and related risks in the future caused by the general need to reduce the interest rate in contrast with the high level charged by banks in Romania and also by the recommendation to continue the trade liberalization policies in contrast with the trade protectionism practiced by many countries during the current crisis.

• Investing in the future. Money from the EU budget is also being spent to boost the car and construction industries, retrain unemployed workers, to develop key transport links around Europe and to help small businesses to grow.

• The criticism of the opposition and the protests of the Romanians cannot improve the performances of the economy, but the restucturing of the public sector, if it is done right, can have positive effects.

We need to guarantee a safe, environmentally friendly energy supply for us and the generations to come. And more must be done to help entrepreneurs wishing to start a new venture or expand a small business.

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# DISINTERMEDIATION IN INDIAN COMMERCIAL BANKS: EVIDENCES FROM PRE AND POST-LIBERALIZATION PHASES

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#### Abstract

With the structural changes witnessed, particularly during post-liberalization phases the possibility of disintermediation in commercial banking sector in India cannot be ruled out. With a set of secondary sources of data for 28 years divided equally into pre and post-liberalization phases, this article tries to trace the evidence of disintermediation, if any in banking industry with respect to their deposit taking and loan disbursal activities. Quadratic trend analysis is made for the four indices developed for the purpose of the study. It is observed that there has been a significant structural shift in household savings in the form of bank deposits from pre-liberalization to post-liberalization period. The impact of shifting away from commercial banks to other intermediary institutions on either deposit or loan function of the banks is not clearly visible. Indices meant to capture the impact of capital market growth on the prime business of commercial banks provide some evidences of disintermediation. Further, when analysed separately for the two phases, the result demonstrates that this phenomenon has taken place during pre-liberalisation only, re-establishes the supremacy of banking in post-liberalisation phase.

Keywords: disintermediation, commercial banks, liberalisation, capital market, structural shift, disintermediation indices

## JEL Classification: G2

#### 1. Introduction

In studies related to the domain of finance, disintermediation generally refers to the declining role of intermediaries in the process of arranging the required finance for the deficit sector from the surplus sector. This can be of overall financial disintermediation where collectively all the financial institutions lose their significance to the capital market or specifically disintermediation in the banking sector. As the growth of capital market all over the globe has affected the traditional functions of financial institutions the phenomenon of financial disintermediation is found in many of the developing as well as developed economies. However, as a result of the existence of transaction and information costs, financial intermediation is unlikely to become redundant. Hence, disintermediation can more properly be defined as a loss in importance of traditional banking activities, such as, the collection of deposits from households and the provision of bank loans to corporate sector. In this scenario, their role shifts to the provision of financial services on a fee basis. This development, which could rather be characterised as 'bank disintermediation', does not necessarily imply an overall decrease in financial intermediation'.

While the term 'disintermediation' is used to describe a situation which takes place with the development of alternative sources of investment, but in relation to banks it describes what happens when money is moved out and invested in other sources. In such direct financing, borrowers and lenders directly deal with each other. Although this term is not directly related with deregulation as disintermediation was already in place much before deregulation (FRBSF 2002) and is mostly because of the availability of alternative instruments of savings and borrowings. Since the decade of eighties, some initiations were made towards development of Indian capital market. Measures including introduction of instruments like Cumulative Convertible Preference Shares, Warrants and Employees Stock Option Scheme; as well as change in government policy towards tax concession and permission for corporate sector to accept deposits from public; all these were initiated to bring about diversity in investor's options and to widen the capital market base. Another significant development during that decade was the emergence and growth of private placement market (Thiripalraju 1993).

The possibility of disintermediation in Indian banking during the post 1991 period, particularly with respect to their deposit taking and loan giving functions due to the development of alternative means of savings and loan is investigated in this article. Precisely, we have examined the changes in household investment pattern i.e. whether they have moved away from banks, and also attempted to trace the impact of capital market growth on these two crucial functions of commercial banks.

Apart from this introductory section the article has four other sections. The next section presents the detail methodology of this work. The third section depicts a brief review of related literature in the context of developed and developing countries including India. The fourth section reports the result of the study along with the supporting data analysis. The last section provides the concluding remarks.

#### 2. Methodology

This work is exploratory in nature and covers a period of twenty-eight years from 1980-81 till 2007-08 that is divided into two phases of pre-liberalization i.e. pre-LP (1980-81 till 1993-94) and post-liberalization i.e. post-LP (1994-95 till 2007-08). Reason for starting from 1980-81 is that during the phase of 1980s a number of new policy initiatives were introduced by the Government of India; such as relaxation of norms for capital market as well as introduction of new instruments of savings with attractive rates of return; that acted as alternative to banks deposits. These were aimed to make the financial system a competitive one posing a challenge to commercial banks that also could lead to disintermediation.

Similarly, after the recommendation of the Narasimham Committee in November, 1991, the government introduced a number of measures with an aim to infuse competitiveness in the financial system. Thus in order to allow liberalization to take its course, the year 1993-94 has been included in pre-LP. Since the 1994 banks have been given free-hand to determine the rate of interest on deposits and loans and also banks were approached capital market for raising necessary resources through equity share issues, the year 1994-95 has been considered as the beginning year of post-LP.

Household is the largest savings sector in Indian economy whose shift to other alternative source of savings leads to a reduction in the capacity of banks' deposit taking. So an evaluation has been made for any shift in the pattern of household sectors' savings by way of ratio and trend analyses with respect to household savings in both financial and physical savings as well as for different forms of financial savings including deposits with commercial banks. Further to capture any impact of disintermediation due to shift in the household investment pattern, a linear trend analysis has been made for two of the ratios i.e., Financial savings as percent to total household savings and Bank deposits as percent to total financial savings. Chows 'F' Test has been applied for identifying any significant shift in the trend from pre to post-LP.

The most important source for banking disintermediation is capital market, a means through which companies tap the investors directly for their requirement of funds. Again a shift by the borrowers from commercial banks to any other non-banking sources of credit is also a cause for bank disintermediation. So, in order to see the impact of capital market and of other non-banking sources on commercial banks' deposit taking and loan disbursal segment, four indices have been developed. Out of which the first two are intermediation indices i.e. Bank deposit intermediation index (BDI Index) and Bank credit intermediation index (BCI Index) meant to capture any impact of disintermediation due to growth of alternative intermediation credit index (BCD Index) are indices meant to see the impact on both deposit taking and credit disbursal capacity of commercial banks. Where BDI Index is Net annual deposit with commercial banks / Total credit by all intermediary institutions, BDD Index is Net annual credit by commercial banks / Total annual capital market mobilisation and BCD Index is Net annual loan by commercial banks / Total annual capital market mobilisation.

#### 3. Overview of Literature

Disintermediation is global; however is not a new phenomenon with financial markets having traded stocks and bonds for the last 150 years. What is relatively new is the rise of commercial paper as a lower cost alternative to bank loans, and also securitisation (Jacque 2001). In many of the developed economies, capital market has gone through dramatic changes with bond market developing to meet the requirements of the long-term creditors; and government and corporations are moving to

market as well as with investors diversifying their portfolio internationally and also NBFCs competing with banks (Dicky, and Fan 2005, Business India 2005, Hauslre 2002). This is leading to shift away from banks to market, with a decline in bank's share in global stock from 45 percent in 1980 to 30 percent today (Business India 2005).

The impact of disintermediation is more intensely visible in case of developed economies which are more of market-based; in comparison to their developing counterparts. For instance US banking industry has witnessed a temporary disintermediation in 1960s due to a rise in the interest rate of alternative assets in economy as well as growth in alternative sources of investment and credit (Hester 1969, Hendershott 1971, Schott 1971). But the present growth rate of banks in terms of both deposit and lending capacity declined as they had to face tougher competition from upcoming new instruments of savings as well as non-banks (Boczor 1978, Lipp 1982, Friedman 1982, Barnard jr 1987, Ghosh 1991, Kehrer 1997, Maloney 2001, Allen, and Santomero 2001, Allen, and Parwada 2002a, Allen, and Parwada 2002b). However, Boyd and Gertler (1995) have concluded that a slight loss of market in the late 1980s and early 1990s was mainly a transitory response to a series of shocks that occurred over this period.

With the implementation of financial sector reform measures since 1996, Japan economy has evidenced gradual disintermediation with a decline in the bank loan portfolio, although bank intermediation still remains the major channel. The factors responsible are shift of private corporate sectors to bond and money market (revealing disintermediation), banker's reluctance in lending to small and medium sized companies and decline in the credit demand by quality corporate borrowers (Batten, and Szilagyi 2002). The recent years' decline in European traditional bank intermediation cannot be considered as financial disintermediation, although this has altered the earnings structure of banks towards fee-based income (Freedman 2000, Swaan De 2000). But review of individual economies brings out some impact of disintermediation. For instance, in Germany, the share of bank deposits in household savings declined by 16 percent points after 1980 and that of insurance increased to 20 percent. (Buch and Goldor 1999); although disintermediation in assets side of banking sector is not visible (Hackethal 2003). While in France the banks are losing in the assets side which in due course may threaten the existence of their entire business (Schmidt, Hackethal, and Tyrell 1998). In Australian market, bank deposits have fallen from 62 percent in 1990 to 45 percent in 2001, with a rise of superannuation asset from 27 to 38 percent in this period (Allen, and Parwada 2002a). But it is the retirement funds that directly compete with no substitution effect between traditional deposits and managed funds (Allen, and Parwada 2002b).

In developing economies some impact of disintermediation is visible over the business of commercial banks due to widening and deepening of the financial systems; but in most of the cases it is seen that banks are still in a dominion position with a slight fall in their intermediary business. For instance in Czech Republic, banks are still in leading position with 80 percent of the assets under them and the non-banking sector is still underdeveloped. But they are facing competition from financial and commercial companies providing varied and innovative services (CNB 2002). As the CEE economies (i.e., Czech Republic, Hungary and Poland) are growing, most of the monies are going from bank to investment funds, i.e., fixed income, cash and mixed funds (Bledowsky 2002). In the Middle East and North African (MENA) region the boundaries between banks and non-banks have abridged. But disintermediation is still in early stage due to slow emergence of securities market (Grais and Kantur 2003). However, in some Latin American countries, bank debit taxes have contributed to disintermediation since 1988 as people opt for more of direct cash transactions or through offshore banks (Kirilenko, and Summers 2002).

Some impact of disintermediation was also visible in Indian commercial banks. During 1980s the introduction of tax concession schemes by LIC and new schemes of Small Savings by Postal Department led to reduction of banks' share in household savings. Further, in post 1991 phase, mostly on the recommendations of various committees, importantly Narasimham Committee 1991 and 1998, the focus shifted towards promoting infrastructure; and over a period of time the system evolved with four segments, viz., banking, insurance, capital and money markets, and specialised institutions of lending, thus deepening the financial system and broadening the sphere of competition for banks and disintermediation.

In Indian financial market financial disintermediation was already in place from the first half of 1980s (Murthy 1984, Jadhav 1988) resulting to 33 percent decline in bank savings in 1981-82 from 53

percent in 1980-81 (Murthy 1984). Again analytical framework made by Jadhav (1988) to study the variations in the ratio of M1 and M3, CandTD, DDandTD revealed declining trend in three ratios, thus revealing that financial disintermediation has set in. Further, due to liberalization of Indian economy and with increased importance of capital market during 1990s the share of bank credit (especially to commercial sector) has declined (EPW 1991, RBI 2000, RBI 2002). Sen (1991) has concluded that with an increase in SLR requirement, the private firms will meet their credit requirements through sell of bonds and shares directly to households resulting in financial disintermediation. Though there is no evidence to support the view of large scale disintermediation; but there is some decline visible on aggregate deposit of commercial banks (Krishnamurthy 1994). Recent studies in this arena are not available to make any inference on the post liberalization situation.

## 4. Data Analysis and Findings

## 4.1. Savings Analysis

Savings is the excess of income over expenditure that arise from three sectors, i.e., household, private corporate and public sector and when pooled together they form the Gross Domestic Savings (GDS); whose analysis for growth and pattern is important. The ratio of GDS to Gross domestic product (GDP) edifies that an increasing proportion of total income of the country is being saved rather than spend. Among the saving contributors households lead the way with almost three fourth of the total followed by private corporate sector and public sector (Table 1). The fall of share of the households is mainly attributed to the growth of private sector in recent years. The equal difference in the range of household savings (HHS) and of financial savings (FS) reveals no firm inclination towards either of the categories. However, a slight shift in saving preference is marked towards financial assets in recent years. As observed by RBI in 1990, that this structural phenomenon of financial savings superseding the physical one is due to the increasing impact of financial intermediation, widening and deepening of the financial system with a large menu of available financial assets as well as improvement in the relative rates of return for financial assets (RBI 1999-00) still holds true. However, the linear growth rates (Figure 1) reveal that the growth of savings in economy has been declining over the years from pre to post-LP. There is a fall of saving growth rates across the sectors, most prominently in public sector. A decline in the growth of HHS (Figure 2) is mainly attributable to the slow rise in financial savings.

Year	GDP (Rs. bn)	GDS		Se (	ctoral Sav as % to G	Physical Savings	Financial Savings	
		(Rs. bn)	(as % to GDP)	Private corporate	Public sector	Household	(as % to sav	household /ings)
1980-81	6,954	269	3.87	8.70	21.64	69.66	54.02	45.98
1990-91	11,937	1,300	10.89	11.66	7.74	80.60	52.63	47.37
2000-01	20,307	4,900	24.57	16.24	-7.39	91.15	52.68	47.32
2007-08	34,027	17,796	52.30	23.43	11.94	64.63	51.89	48.11
Average	15,967	4,016	25.15	19.11	6.01	74.89	50.43	49.58

#### Table 1. Composition of savings in economy

Source: RBI handbook of statistics on Indian Economy, 2008-09



Figure 1. Savings growth in economy (Pre and Post-liberalisation)



Figure 2. Growth of HHS (Pre and Post-liberalisation)

Year/ Period		Currency	Bank Deposits	Capital market investment	Non Banking deposits	Contractual financial assets	Claims on Govt
1980-81	Mean (Rs. bn)	48	147	49	24	110	39
1993-94	CV	0.71	0.61	1.06	1.27	0.72	0.56
1994-95 till 2007-08	Mean (Rs. bn)	324	1401	199	79	963	381
	CV	0.66	0.73	1.41	0.77	0.54	0.96
1980-81 till 2007-08	Mean (Rs. bn)	186	774	124	51	536	210
	CV	1.11	1.24	1.71	1.07	1.06	1.47

#### Table 2. Composition, Means and Variances of Financial Savings

#### Source: Compiled from RBI Data

Though each of the financial instruments has some built-in benefits; bank deposit is the most preferred saving alternative due to its safety and liquidity features (Table 2). The comparative mean figures reveal across the board improvement in financial savings during the post-LP however, the growth of bank deposits as well as claims on government (Figure 3) show that these two instruments have been able to attract more of savings over the period. But the growth of latter is more than that of the former meaning a shift in the preference of savers towards claims on government (RBI 2002). Alternatively growth of capital market investment and non-bank deposits both have turned into

negative during the post-LP. This shows lack of faith among households to park their savings in risky investments.



Figure 3. Growth in alternative financial assets (Pre and Post-liberalisation)

Dependent variables (y)	Period t	Constant a	Slope b	R <sup>2</sup>	Chow's F*
Pinensial and in a differential d	Overall	53.41	-0.14	0.03	0.86 (0.36)
savings (percentage)	Pre-liberalization	49.05	0.37	0.06	0.72 (0.41)
	Post-liberalization	59.83	-1.17	0.59	17.32 (0.00)
Deule deuesite/ Einen siel	Overall	49.18	0.08	0.00	0.07 (0.79)
savings (percentage)	Pre-liberalization	65.13	-2.00	0.60	17.86 (0.00)
	Post-liberalization		2.43	0.52	13.10 (0.00)

Table 3. Trend of Household Savings

\*Level of significance in bracket

In order to see whether there has been any significant shift in the mode of household savings from pre to post-LP; a trend analysis has been made for the two components. As evident from trend analysis (Table 3) the slopes for overall period are not significant (F values being 0.36 and 0.79). But when divided into two phases of pre and post-LP, the result reveal that during the former phase there has been an increase in financial savings expressed as a percent to total household savings but that is insignificant; whereas for the post-LP a significant decline is visible in the same. But for the bank deposits expressed as a proportion to total financial savings, there is a declining trend in the first phase followed by an increase in the same in the latter period and is a sign of bank disintermediation for household savings during the pre-LP. To see whether the shifts are significant or not, Chow's 'F' test has been applied for both the dependent variables. The result confirms that there has been a structural shift in savings in both the form of total financial savings as well as bank deposits of households from pre to post-liberalization and is significant.

#### 4.2. Development of alternative means of Savings and Credit

In addition to commercial banks, there are certain other institutions and also instruments in financial market that mobilise savings from surplus sector and also supply credit to deficit sectors in an economy. It is found that mobilisation of saving by banking, non-banking and capital market has increased by 10 times (Table 4) during post-LP phase indicating a robust financial sector growth in India. However, a higher growth in non-banking category reveals a preference of household in small

savings and insurance and others and could be a contributing factor to disintermediation. On the other hand the growth of bank credit has been very robust during post-LP phase showing the persistent supremacy in the financial sector.

Saving / Credit Channels	Period	Overall	Pre-liberalization	Post-liberalization
	Mean (Rs.bn)	1130.42	202.41	2058.43
1. Commercial Bank deposits mobilisation	CV	1.34	0.65	0.83
	LGR	16.29	16.29	17.41
2. Non-bank institutional	Mean (Rs.bn)	680.07	119.05	1241.08
mobilisation of	CV	1.33	0.75	0.81
savings	LGR	17.60	20.51	21.21
	Mean (Rs. bn)	835.85	102.06	1569.64
3. Bank credit	CV	1.56	0.60	0.98
	LGR	17.21	11.43	21.62
A Assistance disburged	Mean (Rs. bn)	264.67	90.95	438.38
by AIFIs	CV	0.83	0.87	0.39
	LGR	11.99	20.46	-3.29
5 Mobilization from	Mean (Rs.bn)	572.05	77.79	1066.31
Capital market	CV	1.36	1.24	0.79
	LGR	23.83	35.66	16.31
6. Total non-banking	Mean (Rs.bn)	2382.54	399.25	4365.82
mobilisation of	CV	1.33	0.78	0.80
Savings (2+5)	LGR	19.54	24.85	18.68
7. Total non-banking and	Mean (Rs. bn)	836.72	168.74	1504.69
market mobilisation of	CV	1.08	1.03	0.56
	LGR	18.22	25.39	10.14

<b>Table 4.</b> Growth and Variations across t	the Savings a	and Credit	channels
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**Note:** Mobilisation from capital market denotes both saving mobilisation as well as credit to corporate sector. LGR: Linear Growth Rate in percentage and CV: Coefficient of Variations in percentage

Source: Compiled from various publications of RBI and SEBI

The sharp fall in the growth rate of capital market mobilisation which indicates both savings and credit signifies a decrease in investors' preference. This also means a setback in fund mobilisation through public issues that has happened since the mid-1990s that is from 1995-96 onwards (EPW 2001) and can be explained through a lack of information at the hand of the investors. On the other hand, this is also attributed to the lack of confidence on the part of fund raisers in the capital market due to several scams, more particularly in the equity market. The overall picture emanating out of Table-4 is that during post-LP phase disintermediation in the saving mobilisation function of the banks could be a possibility.

## 4.3. Institutional deposit and credit disintermediation

Any consistent fall in the intermediation role of financial institutions reflects overall financial disintermediation and particularly when the deposit taking and credit disbursal role of banking

institutions get squeezed it leads to bank disintermediation. So any negative trend in these parameters indicates such phenomenon. The basic philosophy adopted here is 'disintermediation means a loss of intermediation'. There can be various explanations like the rate of interest, the degree of risk associated or the amount of liquidity and so forth; that form the background towards making decision to choose the mode of investment. But the conclusion point is a decision whether to park the savings in bank or select a non-bank institution which may vary from time to time. The same argument is also applicable in case of credit. Hence, a drop in the banks' intermediation indices (both deposit and credit) in relation to time or otherwise, a negative slope in trend can be considered as bank disintermediation.

As it is evident (Table 5), the quadratic trend does not portray any significant slope for the deposit taking as well as credit disbursal functions of banks in the first phase. Whereas disintermediation is clearly visible as a significant decline is marked for the deposit taking activities in second phase. Otherwise, this is an indication of loss of intermediary business of commercial banks happening due to growth of alternative institutional sources of savings. For the credit disbursal function where disintermediation is noticed for the entire study period, the phase-wise slopes are found to be not significant. These results do not provide a clear picture about credit disintermediation, possibly caused by alternative institutional developments.

Phase	BDI Index				BCI Index	
Trend	Overall	Pre-liberalization	Post-liberalization	Overall	Pre-liberalization	Post-liberalization
a	95.56 (21.57)	101.85 (21.47)	104.29 (16.78)	123.75 (13.89)	97.59 (10.07)	70.82 (4.93)
b	-0.82 (-1.17)	-2.67 (-1.84)	-4.60 (-2.41)	-8.53 (-6.02)	1.12 (0.36)	-1.56 (-0.36)
с	0.01 (0.61)	0.09 (0.99)	0.23 (1.87)	0.33 (7.00)	-0.29 (-1.44)	0.54 (1.87)
$\mathbb{R}^2$	0.20	0.58	0.48	0.70	0.67	0.80
	0.13	0.50	0.38	0.68	0.61	0.76
F	3.09	7.54	5.05	29.66	11.00	21.78
DW	1.08	1.68	1.95	1.46	2.37	1.11

#### Table 5. Trend of Intermediation Indices

Note: Each slope is followed by its t-value in bracket, out of which highlighted ones represent significant at 5 % level

#### 4.4. Capital market disintermediation

The alternative approach to arrive at any conclusion about the disintermediation is to analyse the effect of capital market on the institutional intermediary role. The direct linkage between borrowers and lenders through capital market bypassing intermediaries provides enough scope for disintermediation. Hence, a separate analysis is attempted here to see whether there is any disintermediation effect of capital market both on commercial banks as well as on financial institutions with respect to their deposit taking and credit disbursal.

A quadratic trend analysis is made with respect to the two of the disintermediation indices developed, i.e., BDD <sub>Index</sub> and BCD <sub>Index</sub>. The basic approach adopted here is similar to that in the previous section, i.e., there can be various possible explanations like the rate of interest, the degree of risk associated or the amount of liquidity and so forth; that form the background towards making decision to choose the mode of investment; but here the decision point is cheap availability of funds for corporate houses. And a fall in the disintermediation index (for both deposit and loan) in relation to time, or otherwise, a negative slope in trend can be considered as disintermediation.

Phase		BDD Inde	x		BCD Index			
Trend	Overall	Pre-liberalization	Post-liberalization	Overall	Pre-liberalization	Post-liberalization		
a	84.35	103.15	10.50	92.86	114.33	10.41		
	(14.78)	(10.97)	(4.42)	(14.70)	(11.90)	(2.58)		
b	-8.60	-14.95	-0.55	-10.13	-17.37	-1.04		
	(-9.48)	(-5.18)	(-0.75)	(-10.09)	(-5.90)	(-0.85)		
с	0.23	0.59	0.04	0.28	0.69	0.11		
	(7.43)	(3.18)	(0.92)	(8.28)	(3.65)	(1.39)		
R <sup>2</sup>	0.85	0.89	0.10	0.85	0.91	0.38		
$\overline{\mathbb{M}}^2$	0.84	0.87	-0.06	0.84	0.90	0.27		
F	71.72	45.73	0.62					
	(0.00)	(0.00)	(0.55)	70.53	57.94	3.40		
DW	1.20	1.93	2.20	1.21	2.22	1.59		

Table 6. Impact of disintermediation on Deposit mobilisation

Note: Each slope is followed by its t-value in bracket, out of which highlighted ones represent significant at 5 % level

The evidence which was inconclusive in the previous analysis is found to be rather conclusive with respect to deposit mobilisation as well as credit disbursal. For the overall period as well as during the pre-LP a significant fall in the index vindicates the fact that disintermediation was really happened in Indian economy during the eighties. The significant t-values, high  $R^2$  and absence of serial correlation (Table 6) establish this fact. Perhaps the financial transformation that took place during the 1980s where several new capital market instruments were introduced by the government in order to induce investors towards capital market investment is one of the several reasons. Along with the introduction of new instruments in the equity market segment the method of private placement of securities got a boost. In addition, the corporate sector was also allowed to accept deposits from public. Similarly, the bond market was opened to PSUs for raising funds. All these measures led to a phenomenal progress in quantitative terms of number of issue and amount as well as in qualitative and structural terms by way of establishment of specialised institutions and introduction of innovative instruments to attract more investors. Capital raised by non-government companies through equity shares, preference shares and debentures increased substantially. This followed a marked rise in the amount of capital raised through debentures that came largely on account of certain favourable changes in the guidelines for debenture issue. However, for the second phase, there is no conclusive evidence of disintermediation, irrespective of the negative slopes (insignificant t-values and low  $R^2$ ).

#### 5. Conclusion

With a significant structural shift in the savings mobilization, the time series data analysis does provide some evidences of disintermediation in the India economy. Banking saw a fall in their intermediary activities due to the emergence of capital market also. But this phenomenon was confined to the pre-LP. The disappearance of disintermediation in post-LP despite financial sector liberalization and freehand to companies to price their security issues establishes that bankers still remain as the prominent supplier of finance and also enjoy the confidence of households as safe destinations of investment. Therefore, capital market growth in recent years has not affected the core banking business signifying absence of any disintermediation.

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# THE EUROPEAN ENERGY MARKET: BETWEEN CONSTRAINTS AND PUBLIC SERVICE

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#### Abstract

This paper addresses the issue of European energy market, giving market participants and their contribution and the complexity of such a field. Every state, through the particularities of national energy policy, influences in a lesser or greater measure the energy market developments. As a result, the work brings into question the situation of European countries importing, exporting, net production or net importers of energy, highlighting the major transactions that arise from their cooperation and consequences arising out of here.

Keywords: energy market, trading, energy reserves, energy demand, deregulation, energy dependence

#### JEL Classification: Q4, D40

#### 1. Introduction

The energy sector is a key factor in the development of any society. A developed economy, an adequate social sector at the global level can not be conceived without an efficient energy sector. This paper aims to present current energy situation and trying to formulate answers to questions such as: The public service - energy, friend or foe? The overriding objective for each state in order to find the answer to this question involves the application of an energy policy to sustain economic growth sustainable, based on harmonization of requirements of economic efficiency, social considerations and environmental objectives.

We must understand that energy policy is closely linked to other sectoral policies to support with the performance of government programs. The energy sector must address key national challenges which manifest themselves internally and globally: energy supply security, economic competitiveness and reduce environmental impact. We see such issues and consequences that are involved in these transactions.

#### 2. The current situation of energy sector

In a globalizing economy, the energy policy of a country is made in the context of developments and changes taking place worldwide. For example, global demand for fuel in 2007 has remained relatively unchanged from 2006, it recorded the value of 86.0 mb/day<sup>1</sup> and respectively 84.5 mb/day. in percentage terms, world demand grew by 1.00% in 2006, while continuing to anticipate for 2007, an increase of 1.8%.

From a macro perspective, there are obvious risks that may arise in a global economy. This example can be taken investors should keep in mind that any slow growth or decline of the US economy entail risks for global economic activity. Indeed, in Figure 1, where the evolution of the global demand in 2005-2007<sup>2</sup>, see how it increases from 1.6% in 2005 to 1.8% in 2007, mainly based on the positive developments of the American continent while in Europe, the demand varies very little.

<sup>&</sup>lt;sup>1</sup> The conventional abbreviation for the millions of barrels on day.

<sup>&</sup>lt;sup>2</sup> Oil Market Report, from the 13<sup>th</sup> of March 2007



Figure 1. Increasing global energy demand between 2005 -2007

Source: Oil Market Report, from the 13th of March 2007

By correlation between increasing energy demand on the American continent and decrease US gross domestic product, understand the international position of the state in conditions that are intended to meet demand with limited resources.

Regarding the structure of energy demand is observed that the share of primary energy demand has changed the meaning of future demand in developing countries with economies as noted in the above, the horizon years 2030, it is expected that these states may dominate energy demand. Total energy demand in 2030 will be around 50% higher than at the beginning of the century and about 46% higher for oil. Known oil reserves could sustain current levels of consumption, by 2040, while natural gas by 2070. Projections indicate economic growth, which will involve increased energy consumption. In Europe, forecasts show that in particular natural gas, energy dependence will increase from 50% currently to 70% in 2030. Therefore, one of the main directions of EU energy policies aimed at diversification and multiplication of supply sources, as well as transport routes for hydrocarbons.

In terms of primary energy consumption structure in the world, shows more rapid evolution in the share of natural gas and renewable resources. In Figure 2, we can see the structure of primary energy demand worldwide, and its forecast value.



Figure 2. Demand for primary energy worldwide (Source: World Energy Outlook, 2006)

Thus, we see how the primary energy demand is growing, reaching its maximum values in 2030. According to provisional data for the period 2007 - 2030, demand for nuclear energy is reaching the highest values, with almost 17 thousand million tonnes barrels in 2030. This indicator makes us believe that in 2030 the degree of economic and technical development will be very high for all national economies. Thus, many countries will be included in the international circuit of the energy market due to growing demand for energy, seen as a raw material for economic development. From this point of view, China is the most relevant example.

#### 3. European energy market

The European market for electricity and gas operates within a regulatory framework established by a set of directives<sup>3</sup>. Thus, pursuant to these directives, it was established that in January 2007, demand for energy in Europe decreased by 2.6% over the same month of 2006, this situation is the result of decreased demand for heating fuels, and residual (-11, 8% and -10.5%). However, Europe remains undeniably a major player in the energy market for very long. Below, we present one of the top countries in terms of imports and exports of energy.

Top countries in terms of imports<sup>4</sup>: Five countries in Southeast Europe currently imports 80% of the total energy produced and delivered in the area. The five beneficiaries are: Slovenia (21.8% in 2005, 19.09% in 2006), Croatia (18.9% in 2005, 18.77% in 2006), Serbia-Montenegro (18.8% in 2005, 19.85% in 2006), Greece (14.7 % in 2005, 14.33% in 2006), Macedonia (6.6% in 2005, 7.57% in 2006).

Top countries by gross energy export<sup>5</sup>: In terms of raw energy exports, in 2006 five countries had 89.4% of total (90.8% in 2005). The largest exporters of electricity were thus in 2005: Croatia (25.5% in the market), Bulgaria (23%), Serbia-Montenegro (20%), Romania (12.4%) and Bosnia-Herzegovina (10%). in the first seven months of 2006, the top five exporters of crude power were Bulgaria (22.2%), Croatia (20.9%), Serbia-Montenegro (19.3%), Romania (14.1%) and Bosnia-Herzegovina (12.9%).

Beyond this, we conclude that Member States can be divided, in terms of primary energy sources in three categories: net producers and net importers special category of cohesion countries.

**Net producing countries** are the Netherlands (one of the largest gas producer among the EU countries), Denmark (oil and-a requirement covers 98% of internal resources) and the United Kingdom. **Britain** is a major producer and exporter of energy. As one of the key players in European politics, with Germany, France and Italy, the UK requires a closer look at its energy sector, between 1980 -1990, oil, gas and electricity production came in a vast privatization program, despite very strong opposition expressed by the state or public companies held an absolute monopoly of these activities. A total monopolization, followed by the establishment of regulatory institutions, have created the most open energy market in Europe, the only area that still remains is the state monopoly of nuclear energy. Government energy policy objective was to encourage competition, and the government intervened only to determine the rules.

Net importing countries are Germany, France and Italy. **Germany** is a net importer of gas (78% of needs in 1994) brought especially from Russia, and oil (99% of needs). Germany is at the same time, a major energy producer and an EU carrier. Diversification of energy sources and food safety are two of the major concerns of the German state. Energy policy is not uniform across the organization and involvement of government authorities. Preliminary data for Germany show that in January 2007 were contracted 27.8%) of annual heating oil supplies, given that this month its temperate climate and consumer demand remained unchanged.

<sup>&</sup>lt;sup>3</sup> Directive 2003/54/EC of the European Parliament and the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, Directive 2003/55/EC of the European Parliament and the Council of 26 June 2003 concerning common rules for the internal market in natural gas and repealing Directive 98/30/EC and Regulation (EC) no. 1228/2003 of the European Parliament and the Council of 26 June 2003 on conditions for access to the network, <u>http://ccvista.taiex.be/Fulcrum/CCVista/RO/32003D0796-RO.doc</u>

<sup>&</sup>lt;sup>4</sup> Dinu S. A chance for Romania: the status as a regional leader, balance, no. 27-28. December. 2006-Jan. 2007, 16.

<sup>&</sup>lt;sup>5</sup> Ibidem.

**France** is a net importer of energy. It imports almost all oil and gas that it needs and 75% from coal. Although France has oil and gas reserves, domestic production is maintained at a low level. France has a long tradition in the state energy companies. Electricity de France and Gas de France are the best example. Privatization is on the agenda of government policy and environmental protection as a component integrated energy policy, is still in its infancy.

**Italy** is poor in energy resources and imports of Algerian gas mostly in need, being the country of transit and Algerian gas to Europe. No nuclear sector as a result of the moratorium imposed by referendum in 1987. Energy sector is traditionally the state as in France. Energy holding company ENI components began to be privatized, and ENEL, the electricity company, is also about to be completely privatized, under a restructuring plan activities. Being highly dependent on energy imports, Italy is particularly concerned by increasing energy efficiency and environmental protection.

Small net energy-importing countries are Austria, Belgium, Finland, Sweden and Luxembourg. They should be favored by an energy policy run from Brussels, but in this group of states are important contrasts. Nordic countries put a strong emphasis on environmental protection and nuclear energy (as compared with scarce their neighbors, Denmark and Norway), while **Austria** has a privileged position because of the potential hydropower, which provides about 70% of the domestic production energy. Using biomass ranks second with 11% of domestic production of energy. **Belgium**, totally free of fossil fuels, is based on imports and nuclear power, although there are no development plans in this sector in future. Belgium is one of the strongest adherents of the EU energy policy.

**Ireland, Greece, Spain and Portugal**, countries which have received massive financial support from the richer countries of the EU Social Cohesion Fund, are net importers of energy. They have a much weaker energy infrastructure than other states. The energy sector is relatively weak, the efficiency is low technology and transport systems for gas and electricity are not sufficiently developed.

In February 2007, **Russia** recorded the 200kb/zi energy production, far more than previously predicted values, the values recorded in January and February 2007 values exceeding 4% from the same period last year. However, the apparent increase in production in January and February 2007 should be adjusted taking into account that in the 4th quarter of 2006, energy producers have announced reductions in energy production to take advantage of changes in taxes for the new year, and first quarter of 2006 was exceptionally cold weather made for a time, which did not happen, but offer increased excessively for the first half of 2007. Moreover, the Sakhalin I project has been an impetus for production in early 2007, a rapid increase in production owing to a value of 225 kb / day - worth further exacerbated by the export restrictions have been lifted the end of 2006.

At one time, Gazprom energy giant owned by Russia, has stopped the supply of natural gas, after **Ukraine** has taken without approval of natural gas from pipelines that were in touch with Europe. The dispute has affected the image of Russia as a reliable supplier for Europe and persuaded Gazprom to find new transit routes to Europe to reduce dependence on Ukraine. More recently, Moscow has threatened Ukraine that it would reduce its natural gas flow, if Kiev fails to pay the debt of 1.3 billion dollars by early October.<sup>6</sup>

These are worrying times and the increasing Russian influence over European energy sector, MOL, the largest oil and gas company in Hungary has agreed with the government in case of further reductions in reserves, the increase in storage capacity with Gazprom . The project would expand the existing networks of Blue Stream of Gazprom, which are already functional in the Black Sea, running from Russia to Turkey. From Russia, the new line would pass through Bulgaria, Romania and Serbia to Hungary. Costs would likely be between 3 and 4.50 billion euros. Also, MOL and Gazprom have agreed that Gazprom to build a gas storage of 10 billion cubic meters, but this deal would bring more opportunities in terms of gas supplies to Europe in the long term<sup>7</sup>. And it just happens when the EU is trying to reduce energy dependence on Russia, even at the cost of using inter alia, the use of nuclear energy, building no: atomic plants or new nuclear reactors. The European Commission urged EU Member States to consider a larger scale use of nuclear energy as a means of avoiding increasing

<sup>&</sup>lt;sup>6</sup> <u>http://www.euractiv.ro/uniunea-europeana/articles%7CdisplavArticle/articleID\_11488/Gazprom-ameninta-Kievul- ca-opreste-livrarea-de-gaze-naturale.html</u>

<sup>&</sup>lt;sup>7</sup> Jitianu R. largest energy company in Hungary is the Russian game, *Ziarul Financiar*, no. 2104, Friday, March 30, 2007, 19

dependence on oil and natural gas, thus improving energy security of the Union<sup>8</sup>, this being In fact the main objective pursued in the Conference' Partners liable for responsible energy policy ' that took place in the Lithuanian capital, Vilnius, in October 2007.

As for **Romania**, it argues for developing domestic production of biofuels, nuclear industry or eoliene<sup>9</sup>. Moreover, by 2020 Romania will invest across the energy sector including the production of biofuels, some 30 billion euros, recognizing that '... the energy is the most powerful weapon that Romania can play a within the European Union'<sup>10</sup>.

Energy market in Romania is fairly developed, and after the commissioning of nuclear reactors 2, 3 and 4 of the Kozloduy plant in Cernavoda, Romania could export a quarter of electricity production. Also, for Romania in the year 2007 can be fully considered since energy.<sup>11</sup>

Overall, the energy demand growth combined with geopolitical factors, particularly the Middle East, increased oil prices, which influenced the price increases for natural gas. Another factor behind oil price rise was the lack of global refining capacity, a problem which requires the identification of medium and long term solutions. To these was added the trend by some states, additional stocks to cope with crisis situations.

As a consequence of the above, the price of oil reached \$ 88.60 per barrel on October 19,  $2007^{12}$ . In this context, some have already announced that they want to step up efforts to develop alternative fuels to oil, especially since gas prices follow oil price fluctuations, generally with a delay of six months. The above elements underlying the reorientation energy policies of all countries that are the net importers of energy, to increase focus on the renewable energy and the energy efficiency. However, the opportunity to reassess the closure of nuclear plants in countries that were considering the cessation of electricity production in such plants in the EU 13 countries using nuclear energy production levels are quite high - 30% of the total energy produced. Regarding the functioning of markets, the oil and oil products market is going towards liberalization in most countries, unlike the electricity markets and natural gas.

#### 4. The implications of liberalization of European utility

It seems that lately, the European utilities industry took part in the largest wave of transactions - mergers and acquisitions - unlike previous years, marked by slow changes. Acquisitions are remarkable not only because it involves large sums but also because some contracts are cross border.<sup>13</sup>

The contracts are often concluded in Europe, where there is hope that the regulations will be abolished now closed by the EU, which seeks to liberalize energy markets of the continent and promote competition.

Current wave of contracts between utility providers in Europe started in Spain in September 2005, when Gas Natural launched a 22.5 billion euro bid for Endesa. The aim was to create an energy company large enough to compete with industry giants such as EDF of France and Germany and E. On and RWE. It seems that eventually Endesa by E. On is taken this year to 41 billion euros - a high price, but which reflects, as the Contract and high political risk involved in international takeovers of companies utilities, raising issues of energy security and national pride.

The question in these circumstances is whether companies arising from such transactions are in conflict with the purposes of EU structural relaxation or dismantling of vertically integrated energy companies.

<sup>&</sup>lt;sup>8</sup> http://www.hotnews.ro/articol\_86467-Problema-energetica-europeana-dezbatuta-de-sefii-de-stat-la-Vilnius.html

<sup>&</sup>lt;sup>9</sup> http://www.hotnews.ro/articol\_86467-Problema-energetica-europeana-dezbatuta-de-sefii-de-stat-la-Vilnius.html

<sup>&</sup>lt;sup>10</sup> The Minister of Economy and Finance, Varujan Vosganian, declared at http://www.euractiv.ro/uniuneaeuropeana/articles%7CdisplavArticle/articleID\_10492/Romania-investeste-30-miliarde-de-euro-in-cea-maiputernica-arma-a-tarii.html

<sup>&</sup>lt;sup>11</sup> From the declarations of the Minister of Economy and Finance, Varujan Vosganian, at <u>http://www.sfin.ro/articol\_8604/2007\_anul\_energiei.html</u>

<sup>&</sup>lt;sup>12</sup> http://www.wtrg.com/index.html

<sup>&</sup>lt;sup>13</sup> Alec B., liberalization of European utility companies to push large mergers or acquisitions. Ziarul Financiar, no. 2089 Friday, March 9, 2007, page 17

While other countries have conflicts because of cross-border mergers, Britain has maintained a reputation as the country with the most open energy market. Three of the major UK energy suppliers - EDF, Npower, PowerGen and already owned by French or German companies.

As an overview, the total value of contracts in the utilities sector in 2006 exceeded 250 billion dollars (189 billion euros), almost double compared to the operations of this kind in 2005, representing a significant growth and especially to the 50 billion dollars (37.8 billion euros) in 2004.

Some contracts were concluded between companies from different countries and thus requiring longer and more complicated processes, involving a number of challenges for consultants and higher expenses.

Merrill Lynch and Deutsche Bank have exceeded forecasts and have been involved in contracts worth 104.5 billion US dollars (79 billion euros) and 104.2 billion US dollars (78.8 billion euros). Deutsche Bank has advised the company on the sale of RWE Thames Water and the most important contract for Merrill Lynch was the offer of the E. On company for Endesa and that of Gas of France for the Suez<sup>14</sup>.

Utilities tend to have large amounts of cash but low level of indebtedness, so that most purchases were made with cash or through loans, few contracts involving the issuance of shares. Low ratio between the level of debt and high amounts held in cash available to fund contracts was an important factor in increasing mergers and acquisitions activity. A key factor in this situation might be a longer period on which utility companies were available to restore a balance. Some have practically no debt, allowing them to easily obtain a loan, so it is quite easy to make large-scale acquisitions, in terms of the finance department, with no need for a new issue of shares. However, keeping a good credit rating is important to utilities because, as it involves large scale projects in the long term, such as building power plants, need a stable picture in terms of activities trade. In conclusion, we can say with certainty that the European Union through its agencies and authorities (eg. European Commission) have taken all possible measures to ensure a real market with secure supply of energy, in this context, the European Commission adopted a third package of legislative proposals to ensure Opportune real and effective choice of supplier and benefits to every single EU citizen.<sup>15</sup>

As regards the Balkans, most electricity production facilities are very old and require major rehabilitation, in a study by Bank Mondială<sup>16</sup> estimated that between 2005 -2020 would be rehabilitated with an output power 11,500 MW total installed as follows: 60% by 2010 and 40% in the years 2011 -2020. Total costs for these operations are over 6 billion euros. However, the ability to rehabilitate the plant depends on meeting environmental standards resulting from applying the rules of the Kyoto Protocol. Under these conditions, the capacity can be restored to 9500 MW and decrease costs for the approximately 2.3 billion euros. The most important element of impact on the ability of rehabilitation is that the NOx and SOx. The study also shows the need BM into operation new production capacities in the period 2005-2020, with a net installed capacity of 13,500 MW, of which 2500 MW by 2010 and 11,000 MW in 2010-2020. Of the 2,500 MW, a percentage of 50% will be provided by coal power plants, located in Bulgaria, Kosovo and Serbia, 21% of the gas thermal power plants located throughout south-eastern Europe, and 26% of the plant in Romania (Cernavoda Unit 2). Of the 11,000 MW required by 2020, a percentage of 45% will be provided by coal power plant built in Kosovo and Serbia, 34% in gas power plants throughout the region and 20% of the Bulgarian nuclear power plant (Unit Belene I). The estimated cost of all investments from the region is of 10 billion euros in the period 2005-2020. The energy plan of Romania complements the study with several other major investments BM: Reactor 4 at Cernavoda and Thermoelectric Tender for a joint venture aimed at exploitation of new coal-fired power units (300-500 MW) of power plant the Doicesti, Borzesti and Braila. All this means an extra 1400 -1800 MW net installed. Thus, Romania changed, somewhat, the distribution of new electricity generation capacity in the region, partly due to

<sup>&</sup>lt;sup>14</sup> Alec B., liberalization of European utility companies to push large mergers or acquisitions. Ziarul Financiar, no. 2089 Friday, March 9, 2007, 17.

<sup>&</sup>lt;sup>15</sup> The proposal of the Commission put consumer 's choice, fairer prices, cleaner energy production and security of the supply with the energy, http://www.euractiv.ro/uniunea-europeana/articles%7Cdisplay Article/articleID 11388/Energie-pentru-Europa-o-piata-reala-si-siguranta-in-aprovizionare.html)

<sup>&</sup>lt;sup>16</sup> S. Dinu, A chance for Romania: the status as a regional leader. Balance Sheet, no. 27-28, December. 2006-Jan. 2007, 17.

the uncertain future of the Belene project. However, Romania will have to upgrade coal-fired power plants to meet the EU ETS (Emissions Trading System) and the European and the corresponding provisions of the Kyoto treaty. Costs would rise to several billion euros, which makes it difficult road toward the Romanian energy market leader in Southeast Europe. The only alternative to achieve such a goal would be establishment of joint ventures with international specialized companies, companies that have the ability to attract large amounts in a short period of time and at reasonable cost.

#### 5. Conclusions

We have come together and work I became acquainted with the context of ongoing global energy business, I found the situation of European countries in this market, both in terms of energy resources and energy demand that we learned something about type and volume of transactions that may occur on such a market.

I also saw how some states across the work involved in energy transactions can be classified in terms of production, net imports or exports to countries importing, producing, small net importer, etc., some of them in the light resources and production achieved a privileged position in that market or, conversely, being in a situation of energy dependency.

Finally, we believe that the energy sector - seen both globally and nationally - is experiencing a high complexity and increased precariousness in terms of non-renewable energy resources, a situation that needs bearing on the impending search, identify and use energy of new substitutes for scarce resources.

And here we feel not only examples of military conflicts or misunderstandings that may arise between nations, but also the impact that pollution of the energy sector has on each individual - for example, according to World Health Organization, air pollution caused by activities in the energy sector in 2006 caused no deaths than 2.5 billion, a figure expected to increase in 2030-2700000000. As a solution, the EU is committed under the Kyoto Protocol to reduce emitted.

In this context, if in the years 70, the green energy was considered and treated as a utopian dream of researchers, the situation has changed over time and the vision of 'a solar future' has become a subject of debate. Energy sources both new and renewable energy (biomass, solar, wind, hydro, photovoltaic cell, etc..) have already become, for the industrialized countries, their national targets for energy production structure. Finally, another area of sensitivity of this analysis, each state is heading in that market, knowing that everything related to energy is a matter of national pride.

Solutions for improving energy sector difficulties can only be understood in conjunction with economic competitiveness, security of energy supply and reduce environmental impact, so that we can not only identify: maximize domestic output of each Member State in terms of rationalizing energy consumption, transparency on production costs, increase storage capacity, innovation and upgrading transmission and distribution facilities and production and refining and, continuously looking to new forms of energy, etc..

In this context, we must acknowledge that the use of nuclear energy dependence on Russia in the interests of keeping only one solution can not be limited in both time and space. The negative effects of the main sources of energy must necessarily neutralized, so we can talk about economic development and social development, globally. Environmental consequences and thus the future generations must be considered and monitored at all times.

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