Financial Theory & Practice 3/2015

Vol. 39, No. 3 | pp. 245-347
September 2015 | Zagreb

UDC 336
ISSN 1846-887X

Institute of Public Finance

Publisher
Institute of Public Finance, Smičiklasova 21, Zagreb, Croatia

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Financial Theory and Practice is abstracted and indexed in:
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Financial Theory & Practice 3/2015

Reviewed scientific journal

Vol. 39, No. 3 | pp. 245-347 | September 2015 | Zagreb

Institute of
Public Finance

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Is active management of mandatory pension funds in Croatia creating value for second pillar fund members?

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Article**
JEL: G11, G18, G19, G23
doi: 10.3326/fintp.39.3.1

* The authors would like to thank two anonymous referees for their valuable comments. The views expressed in this paper are solely those of the authors and do not necessarily represent those of the institution in which they are employed.
** Received: June 9, 2015
Accepted: June 29, 2015

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FINANCIAL THEORY AND PRACTICE
39 (3) 245-278 (2015)

Abstract

This paper analyses Croatian mandatory pension funds' investment returns during the 2005-2014 period using performance attribution methodology. Results from active investment management are compared to a long-term policy return. Such analysis is essential to shed light on the contribution of active portfolio management in the second pillar pension scheme. Evidence suggests that in the period analysed portfolio managers have added value through active management decisions. In addition, we determined the sources of portfolio return by breaking down active return into policy, tactical asset allocation and security selection effect.

Keywords: pension funds, performance attribution, policy return, active return, allocation effect, security selection effect

1 INTRODUCTION

The purpose of this paper is to determine whether mandatory pension fund managers in Croatia have added or destroyed value for the second pillar pension fund members during the 2005-2014 period. We have based our analysis on performance attribution methodology. In the first part of the paper we present a short overview of the second pillar pension system in Croatia. We then describe the methodological framework used in the study and present the concerns and difficulties we were faced with when applying it to the Croatian mandatory pension funds. Finally, we present the results of our study: evidence suggests that active management has added around 77 basis points of return per year during the period we analysed.

2 OVERVIEW OF THE PENSION SYSTEM IN CROATIA

In 2002 a pension system reform in Croatia introduced second and third pillar privately managed mandatory and voluntary pension funds to complement the existing government-sponsored system based on the principle of solidarity. The third pillar of the system consists of voluntary pension funds with purely voluntary contributions and is not analysed in this paper. At the same time, mandatory employees' contributions to the existing first pillar "pay as you go" system were partially redirected to second pillar "defined contribution" pension funds where individual pension assets have gradually been built up and invested in capital markets. The market consists of four mandatory pension fund management companies. Until 2014 each of these companies managed one pension fund and all the participants were assuming the same risk profile. A proxy life-cycle model introduced in 2014 saw the creation of three mandatory pension fund categories with different risk profiles: models A, B and C. Each of the management companies must offer all three models to the system participants. Model B funds, in terms of investment strategy and limits as well as assets under management, are clearly the successors of the funds created in 2002. We assumed this when constructing the data sets for our study.

Our study concentrates on the performance results of mandatory pension funds (B model funds after July 2014) during the 2005-2014 period. During that decade assets under management grew from 8 billion HRK to 65 billion HRK (8.5 bln EUR). Mandatory pension funds had 1.7 million members at the end of 2014. Their assets represented almost 20% of the GDP of Croatia.

3 FRAMEWORK

The methodological framework used in this paper is based on that presented in the study by Brinson, Hood and Beebower (1986): actual returns of the pension funds are compared with a "benchmark" return reflecting the investment policy. The investment policy identifies the long-term asset allocation plan, including normal asset classes and normal weights. Hoernemann, Junkans and Zarate (2005:26) define an investment policy as "the basic long-term mix of assets that is most likely to help meet the investor's long-term investment performance and risk objectives". An investment policy is sometimes also referred to as normal, long-term or strategic asset allocation. This framework identifies three sources of return in the investment management process: investment policy return, market timing and security selection. "Timing is the strategic under or overweighting of an asset class relative to its normal weight, for purposes of return enhancement and/or risk reduction" (Brinson, Hood and Beebower, 1986:40). Market timing is also referred to as "tactical asset allocation" in Hoernemann, Junkans and Zarate (2005). "Security selection is the active selection of investments within an asset class" (Brinson, Hood and Beebower, 1986:40). Morningstar's Methodology Paper (2011) states that the allocation effect as presented in Brinson, Hood and Beebower (1986) was not acceptable in its original form. We have, therefore, used, in equation 3, the formula presented by Brinson and Fachler (1985), because, according to Morningstar's Methodology Paper (2011), it is in line with contemporary approaches to component-level attribution and is not in conflict with the formula presented in Brinson, Hood and Beebower (1986) because their results match at the portfolio level.

In order to calculate the benchmark return, R_b, the actual portfolio return, R_p, the allocation effect, *All*, and selection effect, *Sel*, for any given period, we need:

(a) the normal (or benchmark) weights for *n* asset classes *i*: $w_{b,i}$
(b) the actual weights of all asset classes in the funds: $w_{p,i}$
(c) the benchmark returns assigned to each asset class: $r_{b,i}$
(d) the actual return of each asset class in the fund portfolios: $r_{p,i}$.

Equations (1) to (4) are used to calculate R_p, R_b, *All* and *Sel*:

$$R_b = \sum_{i=1}^{n} w_{b,i} * r_{b,i} \quad (1)$$

$$R_p = \sum_{i=1}^{n} w_{p,i} * r_{p,i} \quad (2)$$

$$All = \sum_{i=1}^{n} \left(w_{p,i} - w_{b,i} \right) * \left(r_{b,i} - R_b \right) \tag{3}$$

$$Sel = \sum_{i=1}^{n} \left(r_{p,i} - r_{b,i} \right) * w_{p,i} \tag{4}$$

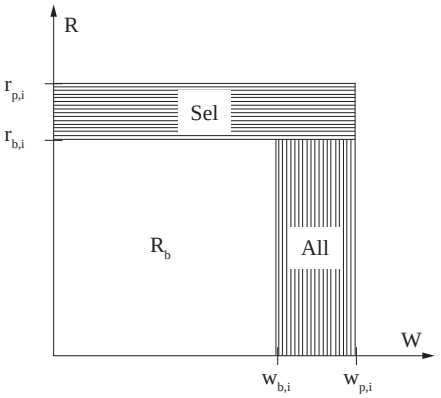
The decomposition of returns as shown in equation (5) can easily be demonstrated from equations (1) to (4).

$$R_p = R_b + All + Sel \tag{5}$$

This simple framework is illustrated in figure 1. The area encompassing the three rectangles R_b, *Sel* and *All*, represents the total return of the portfolio, R_p. R_b is the policy return – the return that would have been achieved by the fund managers if they invested passively in the benchmark portfolio respecting the defined long-term weights of each asset class. The *All* rectangle represents the portion of portfolio return resulting from active allocation decisions – the variation in actual weights of asset classes compared with the normal weights. The *Sel* rectangle represents the portion of portfolio return resulting from active security selection decisions – divergence in selection of individual securities and/or their weight in actual portfolios compared to the benchmark portfolios.

FIGURE 1

The decomposition of portfolio return into policy return, selection and allocation effects



In Brinson, Hood and Beebower (1986) the active return is broken down into allocation, selection and interaction effects. The interaction effect is a small part of the active return that is simultaneously the result of allocation and selection decisions. In figure 1, it would have been represented by the rectangle $(r_{p,i} - r_{b,i})*(w_{p,i} - w_{b,i})$ where *Sel* would have been $(r_{p,i} - r_{b,i})*w_{b,i}$. For the sake of transparency, we would like to point out that results for the selection effect calculated in this paper encompass both the selection and the interaction effect from the original Brinson, Hood and Beebower study and corresponds to equation (4). This is due to the fact that we had to calculate *Sel* as a residual value due to lack of data (see equation 6).

4 THE STUDY

In our study we used monthly data for the ten years period beginning in January 2005 and ending in December 2014. All four mandatory pension funds active in Croatia were included. Data sets for actual portfolio weights and returns were constructed using the Croatian Financial Services Supervisory Agency's (HANFA) monthly reports, pension funds' annual financial statements and the HANFA internal database. When calculating average returns and portfolio structure data at the industry level we used simple arithmetic means. We believe that using asset weighted averaging would have distorted the results in favour of larger pension funds.

In order to define normal asset classes and weights for our benchmark portfolio we analysed the historical structure of the portfolios of each of the four pension funds. Five asset classes were selected for our policy strategy: Croatian government bonds denominated in EUR or HRK, euro-zone government bonds, Croatian stocks, global stocks and cash equivalents. Policy weights were determined based on average holdings of the pension funds. As explained later, we also took into account actual limitations of the market. Finally, we defined proxies for the normal returns of asset classes in our benchmark portfolio. Table 1 summarizes the data collected for pension funds and the benchmark indices that we selected as proxies.

Table 1

Policy asset classes, summary of holdings for 4 pension funds and benchmark indices (%)

Asset class	Average	Minimum	Maximum	Standard deviation	Policy weights[a]	Benchmark index
Cro. gov. bonds	68.76	52.52	87.33	6.57	74.15 67.29	Crogov[b]
Euro. gov. bonds	1.43	0	10.65	2.30	1.15 1.26	Bloomberg/ EFFAS EUGATR Index
Cro. stocks	13.64	1.08	36.77	6.44	3.57 15.81	Crostock[b]
Global stocks	8.50	1.20	18.04	3.67	7.84 8.71	MSCI World NDDUWI Index
Cash equivalents	7.67	0.28	24.33	4.90	13.30 6.94	Cromm[b]

[a] *Top row: 2005-2006; bottom row: 2007-2014.*
[b] *Custom indices due to lack of adequate publicly available total return indices.*
Source: www.hanfa.hr and HANFA internal database.

Because data was not available for actual returns of individual asset classes, $r_{p,i}$, used in equation (2) and equation (4), we calculated actual returns for the funds' portfolios, R_p, by "grossing up" the net-of-fees monthly returns calculated from published

daily unit prices. The grossing-up of returns was calculated using data about management and depositary fees from the pension funds' annual financial statements. We used the formula presented in Bacon (2008, equation 2.31, p. 30). We believe that "before fees" returns are more appropriate for this analysis for at least two reasons: for the comparability between benchmark and pension fund returns and the comparability between pension funds themselves across the same or different time periods. The selection effect, *Sel*, also could not be calculated at the asset class level because we did not have $r_{p,i}$ data. We instead derived it from equation (5).

$$Sel = R_p - (R_b + All) \tag{6}$$

As already mentioned, our calculations were performed on monthly data. We geometrically linked monthly returns to obtain returns for longer periods. The selection and allocation effects were also calculated on a monthly basis. These effects are additive at a single period level. However, they can't simply be added or geometrically linked across multiple periods. In order to achieve additivity, we used the Cariño's logarithmic linking coefficient as demonstrated in Bacon (2008:191-194). The linking coefficient was applied to monthly asset-class level allocation effects and monthly total selection effects.

In our study we assumed that the benchmark portfolio was realigned every month with the long-term asset allocation mix. This means that the drifting of the "normal" weights due to different returns across asset classes was restricted to a one month period.

Before presenting the results of the study, we will focus on four issues that, in our view, are crucial to the interpretation of the results.

4.1 POLICY ASSET CLASSES

Investible asset classes are defined in article 125 of the Act on Mandatory Pension Funds (2014). These are, in a nutshell, central and local government bonds, corporate bonds, stocks, deposits and cash equivalents. Issuers must be from EU (including Croatia) or OECD countries. Exposure to these asset classes can also be achieved through investment in UCITS funds and derivative instruments. Alternative investment funds as defined by the EU Directive on Alternative Investment Fund Managers are allowed and could theoretically lead to exposure to alternative asset classes. Although the investment limits do not directly discriminate against geographical diversification of funds' assets, article 129 of the Act states, for B model funds, that at least 60% of the funds' assets must be traded in local currency. Earlier regulation prescribed mandatory investments in Croatian government bonds.

Analysis of actual asset allocations clearly showed that all four funds invested most of their assets in Croatian government bonds denominated in HRK or EUR (domestically issued or issued on international capital markets). Our first asset

class consists of these bonds. Euro-zone government bonds represent our second asset class. We hesitated to include them in our study because of their relatively low weight in most periods. However, we believe that they deserve to be represented as a particular asset class at least to highlight the "home bias" evident in fund managers' decisions. Thirdly, Croatian stocks represent a separate asset class because we detected a very clear "home bias" there too, despite the very small size and low liquidity of the market. The fourth asset class is global stocks. Unlike bonds, where investments were constrained to the euro, the four pension funds we analysed invested in stocks globally despite currency risk. Finally, the fifth asset class represented in our study is cash equivalent instruments. They appear mostly as a liquidity reserve position and are temporarily built up in advance of government bond issues. Cash equivalent instruments are exclusively domestic.

Other investments were also present in the funds' portfolios. However, we did not create a separate asset class for them. We rather allocated them to one of the above-defined five asset classes: particular UCITS funds and alternative funds were allocated depending on their individual investment policies, Croatian and foreign corporate and municipal bonds were respectively allocated to Croatian government and euro-zone government bonds. Alternative funds were mostly Croatian equity funds with insignificant amounts invested in real-estate and private equity funds. We therefore added them to the Croatian stocks asset class.

4.2 BENCHMARK INDICES

Choosing appropriate benchmark indices for local asset classes was a very difficult task because there are no publicly available total return indices covering the entire period. The Zagreb Stock Exchange started publishing its Crobex Total Return equity index only in February 2014. To overcome this, we first used data available for the Crobex index from 2005 to 2014 and "grossed it up" with an assumed evenly distributed annual dividend yield of 3%. However, this approximation proved to be inappropriate because according to article 69 of the Act on Mandatory and Voluntary Pension Funds (1999) pension funds were allowed to invest exclusively in the first quotation of the Zagreb Stock Exchange while the Crobex index also included stocks traded in lower segments of the market. Practically, this meant that we could not use the Crobex index to represent our normal asset class for the full period of the study because most of the stocks included in the Crobex index were not directly investible for pension funds. The ban on stocks out of the first quotation was lifted in 2007 with amendments to the Act on Mandatory and Voluntary Pension Funds (1999). More detailed implementation rules were given in article 4 of the Regulation on Additional Investment Criteria and Limits for Pension Funds in December 2007. In order to avoid inconsistencies, we decided to create a custom total return free float capitalisation weighted index including only the stocks in the first quotation for 2005 and 2006. From January 2007 we used the "grossed up" Crobex return, mostly because the assets under management of UCITS funds with exposure to local equity rose significantly and could be

used to achieve indirect exposure to the broader Crobex index. We named this blended index Crostock. Hence, our custom index for the first two years is very poorly diversified, just as were the domestic stock portfolios of pension funds. In 2005 it consisted of stocks of only five companies (Croatia osiguranje, Istraturist, Medika, Pliva and Podravka). INA and Viro were added to that list in 2006. Our custom index is dominated by Pliva until October 2006. It is also marked by the inclusion of INA late in 2006. The difference in total return between the original Crobex index (not including dividends) and our custom Crostock index is substantial, not only because of the effect of dividends. While the Crobex index increased by 11.61% (1.1% annually), the Crostock index had a total return of 84.56% (6.32% annually). The difference was most substantial in 2006 when the custom Crostock index outperformed the Crobex index by as much as 47.68 percentage points. This is because most of the stocks quoted on the first quotation of the Zagreb Stock Exchange posted impressive returns in 2006 and because the weights of the individual stocks within the index fluctuated wildly. Firstly, Pliva's free float decreased sharply after a takeover bid, leading to an increase in the weight of other companies' stocks. Secondly, the inception of INA into the first quotation of the Zagreb Stock Exchange led to a decrease in the weights of all other companies. Table 2 gives yearly returns of the Crobex and Crostock indices. Using the publicly available Crobex index in our study without any customization would have resulted in a much higher outperformance of pension funds compared to the investment policy return. It is interesting to note that the "grossed up" Crobex index, the use of which we abandoned, would have demonstrated a compound annual rate of return of only 4.27%, making it the worst performing asset class in the 2005-2014 period. From table 3 we can see that Croatian stocks have the highest standard deviation of monthly returns making them the riskiest asset class. The fact that using modified data for only 2 years out of 10 (2005 and 2006) added up 205 basis points annually to the return of the Croatian stocks asset class shows how delicate a task it is to define an adequate benchmark. This is obviously an important but unavoidable shortcoming of our study. A discussion on the merits of Croatian stocks in pension funds' portfolios is beyond the scope of this paper.

A local asset management company calculated and published on Bloomberg a total return, market value weighted, Croatian government bond index for EUR and HRK denominated bonds, called CROBOND. This index included Eurobonds denominated in EUR, local bonds traded in HRK but linked to the EUR ("currency clause" bonds) and pure HRK bonds. Such an index was, in our opinion, a good representative of the pension funds' investment policies. Unfortunately, the CROBOND index (Bloomberg ticker ZBIBOND Index) covers only the period until September 2013. The Zagreb Stock Exchange started publishing a total return bond index in December 2011. We did not use it to construct our custom index because it does not include Croatian Eurobond issues. To complete our data set from September 2013 to December 2014 we used data on all Croatian government bonds issues over the period of our analysis, provided to us by one of the

pension fund management companies. We tailored it to our needs by including only HRK and EUR denominated bonds (including "currency clause" bonds) and excluding USD bonds. We called this blended index Crogov.

Table 2

Yearly returns of the Crobex and Crostock indices (%)

	Crobex	Crostock
2005	27.72	27.90
2006	60.74	108.42
2007	63.17	68.14
2008	-67.13	-66.13
2009	16.36	19.90
2010	5.33	8.54
2011	-17.56	-15.05
2012	0.01	3.05
2013	3.10	6.23
2014	-2.72	1.08
Return over period	11.61	85.71

Source: Zagreb Stock Exchange, authors' calculations.

As with stocks and bonds, there is no publicly available index for the HRK money market. Market data from which an index could be constructed retroactively are also not readily available. Therefore, we decided to create a proxy for the HRK money market asset class return by using equally weighted returns of the four largest HRK denominated money market funds in Croatia (ZB plus, PBZ novčani, Raiffeisen cash, Erste novčani). All four funds were active through the entire period covered by our study. We "grossed up" net-of-fees returns for the funds using the same methodology we used for grossing up pension fund returns and called this index Cromm. We believe that money market funds return is a valid benchmark for the cash equivalent asset class.

For the euro-zone government bonds asset class we selected the Bloomberg/Effas Euro bloc government bond index (Bloomberg ticker EUGATR Index). Finally, for the global stocks, we chose the MSCI World index (unhedged, Bloomberg ticker NDDUWI Index). The pension funds mostly achieved exposure to global stock markets through direct investments in individual stocks without searching to diversify their portfolio. At the same time, they invested in particular market segments through ETFs probably depending on their market forecasts at that time. We used an unhedged rather than a euro-hedged index because currency exposure restrictions in the Act on Mandatory and Voluntary Pension Funds (1999) applied until 2014 and did not recognize currency hedging as a means of increasing allowed investments out of Croatia.

All indices were translated into HRK for consistency reasons.

Table 3 shows compound annual returns, standard deviations of monthly returns and the correlation matrix of monthly returns for the benchmark indices. It is interesting to note that Croatian government bonds and Croatian equity exhibit only a moderate positive correlation of monthly returns with euro-zone government bonds and global stocks respectively.

TABLE 3
Summary of returns for benchmark indices

Index	Annual return (%)	Standard deviation (%)	Correlation of monthly returns				
			Crogov	EUGATR	Crostock	NDDUWI	Cromm
Crogov	5.53	1.17	1	0.44	0.26	0.31	-0.02
EUGATR	4.92	1.35	0.44	1	-0.25	-0.02	0.04
Crostock	6.32	8.10	0.26	-0.25	1	0.47	-0.03
NDDUWI	7.22	3.84	0.31	-0.02	0.47	1	-0.09
Cromm	4.77	0.18	-0.02	0.04	-0.03	-0.09	1

Source: Bloomberg, Zagreb Stock Exchange.

4.3 POLICY WEIGHTS

In Brinson (1986), long-term average exposures were used as normal weights for the selected asset classes. Initially we planned to use the same approach because there is no publicly determined benchmark for the industry as a whole or for individual funds. However, in addition to the difficulties with the selection of benchmark indices for Croatian asset classes, we encountered difficulties with the setting of "normal weights", in particular for Croatian equity. The market capitalization and free float of the stocks included in the first quotation of the Zagreb Stock Exchange were too low to achieve a substantial exposure to the local market while direct investments out of the first quotation were prohibited until the end of 2007. Indirect exposure to the broader market was possible through UCITS funds; however, pension funds were allowed to invest only in funds with assets under management of over 100 million HRK and were not allowed to own more than 10% of the total number of units outstanding. According to data available, the maximum direct and indirect exposure to Croatian equity that could have been achieved by the pension funds' managers during 2005 and 2006 was on average 7.2%. Actual exposure was 3.5%, which is, in our opinion more realistic because an exposure of 7.2% implies the purchase of a very large part of the free float of all stocks in the first quotation. We calculated the maximum direct and indirect exposure applying regulatory limits to the market value of Croatian stocks listed in the first quotation and assets under management of investment funds pursuing "Croatian stocks" investment strategies. At the same time, investments outside Croatia were restricted to 15%. These practical limitations of the market, combined with various subsequent changes in regulatory limits, are the main reason why domestic and foreign asset classes could not be approached interchangeably by portfolio managers and why it is impossible, in our opinion, to determine unique long-term

policy weights covering the entire period. After thoughtful consideration, we decided to use two sets of "normal weights" – one using the average exposure for the 2005-2006 period and another one for the 2007-2014 period. These weights are shown in table 1.

With the aim of performing a reality check of our results, we performed the same calculations using another set of "normal weights" based on regulatory investment limits. In that case also, we divided the 10 years into two sub-periods: 2005-2006 and 2007-2014, primarily because until 2007 investments outside Croatia were limited to 15%. We used the principle that the "normal weight" should be in the middle between the regulatory minimum and maximum exposure to an asset class. We tried to reconcile this with the above mentioned limits on investments outside Croatia and foreign currency exposure limits that replaced them in 2007 following an amendment to the Act on Mandatory and Voluntary Pension Funds. The results of this exercise are shown in table 4. The advantage of this approach is that it reduces the "home bias" and a certain "overweighting" in stocks. Despite some differences, results are in line with the average weights exhibited in table 1. This does not come as a surprise, as regulatory limits are necessarily the basis for the creation of strategic and tactical asset allocation within fund management companies. If we compare normal weights based on regulatory limits with the actual average asset allocation from table 1, it appears that pension funds are, contrary to the impression disseminated by the media, underweight Croatian government bonds and overweight stocks.

TABLE 4

"Normal weights" based on regulatory investment limits (%)

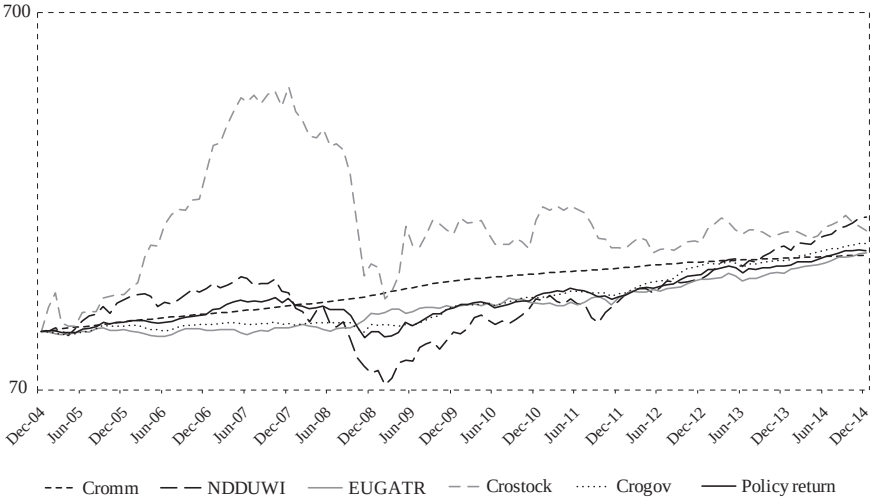
Asset class	2005-2006	2007-2014
Cro. gov. bonds	75	70
Euro. gov. bonds	5	5
Cro. stocks	5	10
Global stocks	5	10
Cash equivalents	10	5

Source: Act on Mandatory and Voluntary Pension Funds (1999), Act on Mandatory Pension Funds (2014), authors' calculations.

Figure 2 shows the dynamics of benchmark indices over the life-span of the study and the corresponding "policy index" based on average weights. The base value of all indices was set to 100. We used a logarithmic scale to achieve better visibility. The picture clearly shows the dramatic development of the Crostock index: it reached its maximum value of around 445 in December 2007 when it achieved a three-year performance of 345%. During the same period, global equities as represented by the NDDUWI index rose 26%. Again, this explains why the results of our study depend so much on the choice of policy weights.

FIGURE 2

Benchmark indices' and policy return from 2005 to 2014



Source: Bloomberg, Zagreb Stock Exchange, authors' calculations.

4.4 TIME HORIZON

Privately managed second pillar mandatory pension funds started investing in May 2002. Investment results from 2002, 2003 and 2004 were not included in our study due to difficulties in obtaining portfolio structure data and because assets under management were very small and grew at very high monthly rates, benefiting from the mandatory monthly contributions from members. Therefore, we believe that investment results from the first few years after the start of the pension reform would not add any value to the relevance of our study. The 10 years period included covers 79% of the life-span of Croatian pension funds and covers both bear and bull markets.

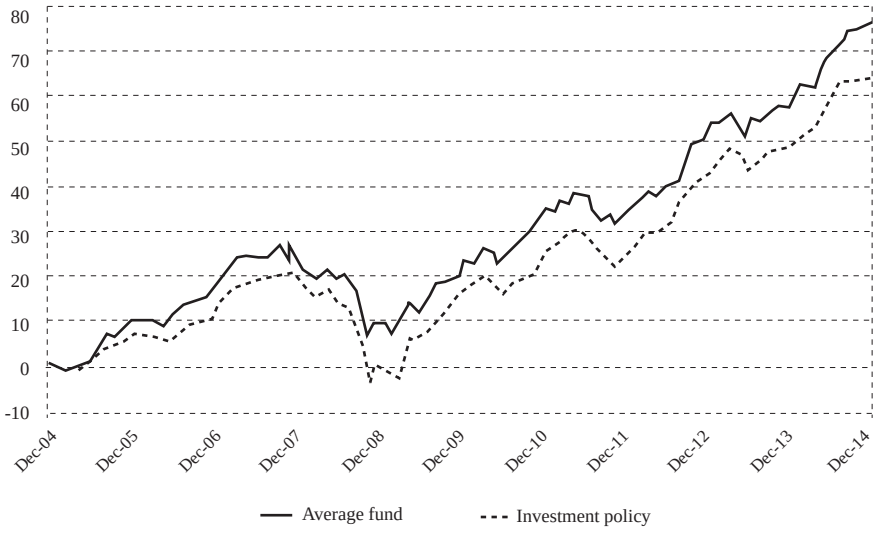
Hoernemann, Junkans and Zarate (2005) argue that ten years is a relatively short time horizon, in particular if it covers a period that would not qualify for a "normal" financial environment. However, when Croatian pension funds are concerned it is the longest time horizon for which consistent information is available. On the other hand, the life-span of our study can hardly qualify for a particularly "normal" period: 2008 and the first quarter of 2009 saw one of the most severe financial crises in history, while the periods preceding and succeeding it saw an extraordinary run in equities. Figure 2 highlights the extraordinary bubble in Croatian equities that started inflating in 2005 and eventually burst in 2008. In addition, in more recent years we have witnessed an unprecedented bull run in bonds. Nevertheless, we believe that such considerations do not affect the validity of our calculations for the 10-year period analysed. It is not the intention of this paper to use historical data for making forecasts on the long-term aptitude of Croatian pension fund managers to outperform their investment policy return but rather to shed light on the results from the previous decade and hopefully set the basis for a well-reasoned debate.

5 RESULTS

We began by calculating gross-of-fees returns for each of the four mandatory pension funds. We then calculated the return of the "average fund" using simple arithmetic average of the monthly returns of individual funds. We also calculated the return for the "investment policy". The total return for the average fund was 76% for the 10-year period. The mean annualized compound total return was 5.82%. The total policy return over 10 years was 63.73%, i.e. 5.05% annually. The study suggests that, on average, portfolio managers of Croatian mandatory pension funds added 77 basis points per year through active investment management. The best performing fund added 125 basis points per year, while the worst performing fund lost 22 basis points. Only one out of four funds underperformed its benchmark. Figure 3 shows the performance of the "investment policy" portfolio and of the "average fund".

FIGURE 3

Comparative performance of the "investment policy" portfolio and the average fund from 2005 to 2014 (%)



Source: Authors' calculations.

The results of the performance attribution analysis suggests that the average fund lost 801 basis points in market timing over 10 years, and gained 2,028 basis points in security selection. The effects on individual funds varied from a low of -1,387 basis points to a high of -133 basis points for tactical allocation and from a low of +1,044 basis points to a high of +2,570 basis points for security selection effects. Table 5 shows average, minimum and maximum timing and selection effects and actual pension funds' returns. This wide range of results shows that portfolio managers actually can to a large extent add or destroy value for pension funds' members through active investment decisions despite regulatory investment limits. The best performing fund displayed positive total active return of 2,061 basis points,

while the worst performing fund showed negative total active return of 343 basis points, over the 10-year period analysed. The worst performing fund displayed the worst results in both market timing and security selection skills. However, the best performing fund displayed the smallest loss in market timing while the best result in security selection was displayed by the second worst performing fund.

TABLE 5

Actual portfolio returns, benchmark returns, timing and selection effects from 2005 to 2014 (%)

	Average	Minimum	Maximum
Benchmark return	63.71	–	–
Timing effect	-8.01	-13.87	-1.33
Selection effect	20.28	10.44	25.70
Actual portfolio return	76.00	60.31	84.34

Source: Authors' calculations.

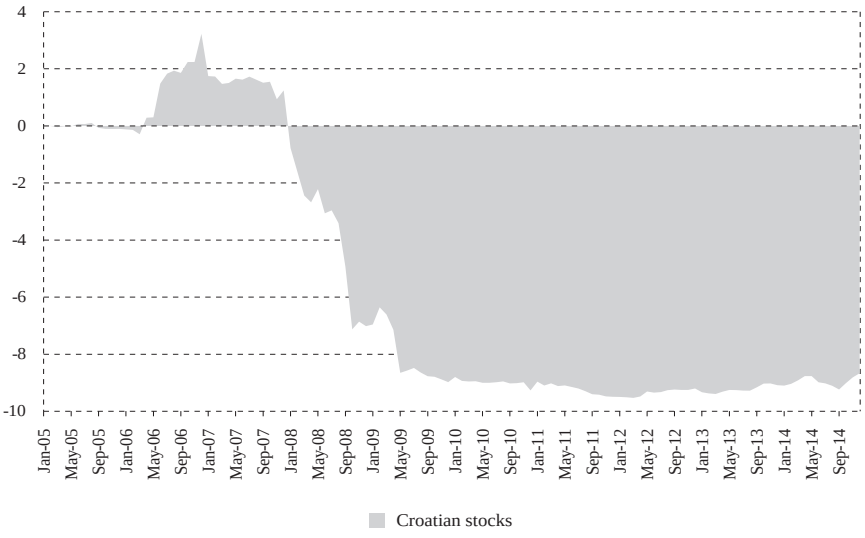
When scrutinized at the individual asset class level, our calculations show that the negative asset allocation effect is on average largest in the Croatian stocks asset class. The total tactical asset allocation effect for the Croatian stocks asset class in the average fund is -867 basis points. Total allocation effects are much lower for other asset classes: +281 basis points for global stocks, -261 basis points for Croatian government bonds, -58 for Euro-zone government bonds and +103 for cash equivalents. As figure 4 very clearly shows, most of the negative tactical asset allocation effect was accumulated in 2008 during the stock market crash. This happened because funds had gradually increased their exposure to Croatian stocks during the previous three years and started 2008 over-weighted in that particular asset class. Actual allocation to individual asset classes at monthly level can be seen in appendix. Moreover, changes in regulation allowed them to purchase Croatian stocks in lower trading segments of the Zagreb Stock Exchange from December 2007. According to evidence, pension funds actively increased their positions in Croatian stocks during the 2008 crisis. This further exacerbated the negative tactical allocation effect as Croatian stocks did not recover when most of the global stock markets did.

These results suggest that Croatian pension fund managers make poor tactical asset allocation decisions while at the same time excel at security selection. This result, in our opinion, needs to be interpreted with care. First of all, as we have seen, it is a very difficult task to determine policy weights due to inherent problems with Croatian asset classes and changes in regulation during the covered period. Secondly, since we do not have data on actual performance of the individual asset classes in funds, our security selection effect is a residual value (see equation (6)). The selection effect as calculated in our study encompasses not only security selection and interaction as defined at the beginning of this paper, but also foreign exchange gains and losses from active foreign currency bets and hedging arrangements as well as all other possible effects (arbitrage, intra-period

trading, etc.). If the funds, for example, experienced large positive effects from hedging currency exposure, the real allocation effect would be more positive than the results suggest and the real security selection select would be lower. It is also worth noting that the selection effect could be that high because of the influence of trading by pension funds on market prices ("market impact"). This is particularly relevant for the Croatian stocks asset class where high volatility, poor diversification and low trading volumes compared to assets under management of the pension funds could easily have caused outperformance as a side effect of the market impact either by overweighting stocks considered fundamentally attractive by the portfolio managers or as a deliberate attempt by the portfolio managers to take advantage of the market impact to beat their peers or internal benchmarks. As previously mentioned, we were not able to calculate selection effects at asset class level. However, figure 5 suggests that most of the positive selection effect was cumulated during the stock market crash of 2008 – the same period during which negative allocation effects were cumulated. During 2008, the total negative allocation effect for the Croatian stocks asset class was -826 basis points (103% of the total allocation effect over the study period) while the total positive selection effect during the same period was 1,642 basis points (over 80% of the total selection effect over the study period). That might imply that the positive selection effect on the Croatian stocks asset class during the 2008 market crash was larger than the negative asset allocation effect on the same asset class. Unfortunately, data are not available to confirm or reject that hypothesis. Detailed calculations of allocation and selection effects at monthly level are given in appendix.

FIGURE 4

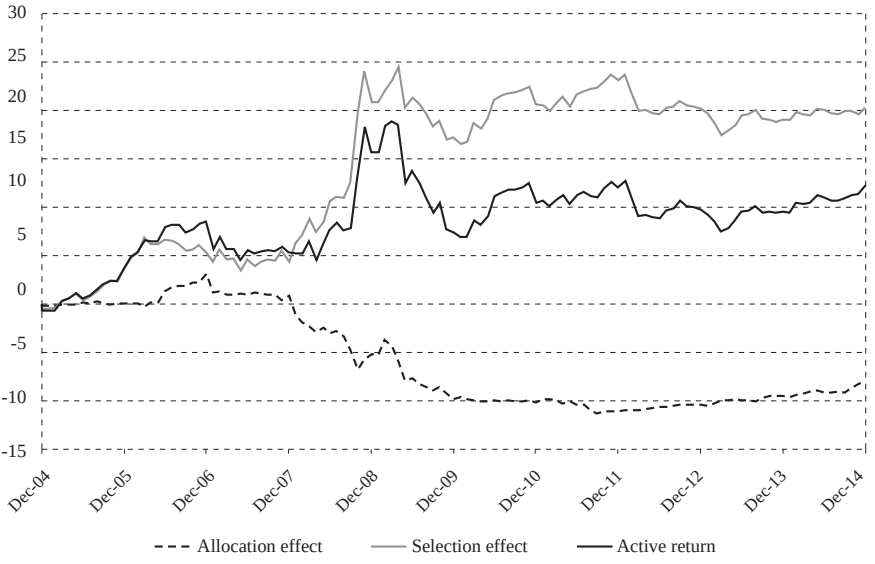
Croatian stocks asset class: cumulative asset allocation effect during the 2005-2014 period (%)



Source: Authors' calculations.

FIGURE 5

Active return, allocation and selection effect for the average fund from 2005 to 2014 (%)



"The Brinson group's study concluded that active management through the selection of individual securities and tactical asset allocation resulted, on average, in a loss of 1.1% for the pension funds, compared with what would have been earned if the fund managers had passively invested at the strategic asset allocation" (Hoernemann, Junkans and Zarate, 2005:26-27). Ibbotson and Kaplan (2000) also explore what portion of the return level is explained by policy return. They calculated the percentage of fund return explained by policy return for each fund as the ratio of compound annual policy return divided by the compound annual total return for the actual fund. "A fund that stayed exactly at its policy mix and invested passively will have a ratio of 1.0, or 100 percent, whereas a fund that outperformed its policy will have a ratio less than 1.0" (Ibbotson and Kaplan, 2000:32). The authors performed calculations on the data sets used in the Brinson studies and their own study and showed that on average, policy accounted for a little more than all of total return. Our study, like the studies conducted in Brinson, Hood and Beebower (1986) and Ibbotson and Kaplan (2000) in the United States, concludes that investment policy provides the largest portion of return. This is not surprising as pension funds are long-term investors and tend to stick to strategic allocation. In addition, because they usually manage large portfolios, they cannot make quick changes in asset allocation. However, the results of active management, using the example of Croatian pension funds, are positive. Our study shows that the average mandatory fund manager in Croatia added 77 basis points on average per year through active asset management. Croatian pension funds outperformed the policy portfolio showing an average ratio of compounded annual returns, calculated as in Ibbotson and Kaplan (2000), of 0.87. More surprising is the size of the asset

allocation and security selection effects. Insufficiency of data prevents us from giving a precise interpretation of such results, but the size and the volatility of Croatian stocks seem to be the main cause behind them.

As mentioned earlier, we also conducted an analysis with policy weights defined as in table 4. A different investment policy resulted in a policy return over the ten year period of 71.2% instead of 63.71%. The average pension fund still outperformed the benchmark, this time by 29 basis points per year.

6 CONCLUSION

Our study suggests that the average mandatory pension fund manager in Croatia has succeeded in adding value to pension fund members through active investment decisions. According to our calculations, the annual compound effect on returns is 77 basis points. The very wide range of active returns achieved by the fund management companies suggests that active investment management decisions actually can add or destroy significant value for the pension funds' members despite regulatory investment limits. Calculations show that funds have on average exhibited negative asset allocation and positive security selection effects. Unfortunately, due to lack of data on actual performance at asset class level we cannot determine precisely the sources of this positive return in security selection. Most of the negative asset allocation effect was cumulated during the stock market crash of 2008 when pension funds were overweighted in Croatian stocks. This asset class demonstrated the highest standard deviation of monthly returns combined with poor long term performance and lack of liquidity that prevented the swift implementation of tactical allocation decisions. Clearly, the lack of publicly available and investible total return benchmark indices for the Croatian market is an obstacle for the development of adequate benchmarking and performance assessment of pension funds. The creation, for example, of Croatian equity "size" benchmarks (e.g. large, mid and small caps) that would also take into consideration free float would make it easier to create "realistic" benchmarks for institutional investors. Obviously, retroactive calculation of total returns of such indices, or at least the Crobextr index, would tremendously facilitate any historical analysis. Similarly, the calculation and publication of a HRK money market index and total return indices of the Croatian government bonds universe (local and international bonds) would help in the achievement of comparability and would certainly give credibility to any kind of performance assessment, reporting or advertising by pension or investment fund managers. We believe that investible benchmarks and unambiguous performance attribution results would bring long-term benefits for both fund managers and members of the pension funds. Firstly, fund managers would explain more easily and clearly to their clients what is happening with their pension assets. This is particularly important in times of turmoil on financial markets. Secondly, it would be easier to determine and rank the quality of portfolio management in the medium and long term. Ultimately, this would lead to more competition, a focus on sustainable returns and additional improvement of the investment process in place in Croatian pension fund management companies.

APPENDIX

Monthly allocations, returns, allocation and selection effects (2005-2014)

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Jan-05	DS	3.50	3.57		15.72		-0.02	
	GS	6.59	7.84		0.31		0.00	
	DB	82.03	74.15		-0.25		-0.09	
	EB	1.67	1.15		-0.35		-0.01	
	MM	6.20	13.30		0.47		0.00	
	Sub.	100.00	100.00	0.09	0.46	1.00	-0.12	-0.51
Feb-05	DS	3.66	3.57		9.42		0.01	
	GS	7.13	7.84		1.71		-0.02	
	DB	77.71	74.15		-0.57		-0.04	
	EB	1.56	1.15		-1.21		-0.01	
	MM	9.93	13.30		0.43		-0.02	
	Sub.	100.00	100.00	0.10	0.09	1.00	-0.07	0.09
Mar-05	DS	3.72	3.57		-16.55		-0.04	
	GS	7.95	7.84		-1.22		0.00	
	DB	67.68	74.15		-1.01		-0.04	
	EB	1.05	1.15		-0.21		0.00	
	MM	19.60	13.30		0.75		0.23	
	Sub.	100.00	100.00	-0.80	-1.34	1.01	0.15	0.77
Apr-05	DS	2.85	3.57		-2.43		0.03	
	GS	7.97	7.84		-3.28		-0.01	
	DB	77.22	74.15		0.33		0.02	
	EB	1.01	1.15		0.41		0.00	
	MM	10.94	13.30		0.51		-0.02	
	Sub.	100.00	100.00	0.14	-0.03	1.00	0.02	0.26
May-05	DS	4.04	3.57		0.00		0.00	
	GS	8.30	7.84		4.60		0.03	
	DB	73.99	74.15		0.04		0.00	
	EB	0.95	1.15		0.30		0.00	
	MM	12.71	13.30		0.43		0.00	
	Sub.	100.00	100.00	0.76	0.45	0.99	0.03	0.49
Jun-05	DS	4.30	3.57		8.89		0.09	
	GS	8.05	7.84		4.76		0.01	
	DB	74.15	74.15		1.31		0.00	
	EB	1.34	1.15		1.18		0.00	
	MM	12.16	13.30		0.40		0.03	
	Sub.	100.00	100.00	1.38	1.73	0.98	0.12	-0.70
Jul-05	DS	2.65	3.57		0.69		0.00	
	GS	7.44	7.84		3.11		-0.02	
	DB	68.91	74.15		0.09		0.03	
	EB	2.38	1.15		-0.67		-0.02	
	MM	18.62	13.30		0.45		0.01	
	Sub.	100.00	100.00	0.59	0.39	1.00	-0.01	0.35

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Aug-05	DS	2.09	3.57		0.00		0.04	
	GS	7.38	7.84		0.80		0.01	
	DB	76.65	74.15		1.75		0.01	
	EB	3.57	1.15		2.19		0.03	
	MM	10.32	13.30		0.51		0.05	
	Sub.	100.00	100.00	1.86	1.46	0.98	0.13	0.54
Sep-05	DS	1.96	3.57		8.71		-0.17	
	GS	7.01	7.84		4.77		-0.03	
	DB	76.77	74.15		2.08		-0.01	
	EB	4.83	1.15		0.72		-0.10	
	MM	9.43	13.30		0.57		0.11	
	Sub.	100.00	100.00	2.64	2.31	0.98	-0.20	0.76
Oct-05	DS	2.30	3.57		0.76		-0.03	
	GS	7.88	7.84		-3.94		0.00	
	DB	74.82	74.15		-0.68		0.00	
	EB	2.99	1.15		-1.87		-0.04	
	MM	12.03	13.30		0.46		-0.03	
	Sub.	100.00	100.00	-0.60	-0.75	1.01	-0.10	0.36
Nov-05	DS	2.82	3.57		1.10		0.00	
	GS	8.89	7.84		6.55		0.10	
	DB	74.33	74.15		0.22		0.00	
	EB	2.78	1.15		0.17		-0.02	
	MM	11.18	13.30		0.40		0.01	
	Sub.	100.00	100.00	0.79	0.77	0.99	0.09	-0.06
Dec-05	DS	3.07	3.57		-0.03		0.00	
	GS	9.38	7.84		1.71		0.03	
	DB	71.09	74.15		0.22		0.01	
	EB	2.30	1.15		0.68		0.01	
	MM	14.17	13.30		0.65		0.00	
	Sub.	100.00	100.00	1.20	0.39	0.99	0.06	1.31
Jan-06	DS	3.26	3.57		4.31		-0.02	
	GS	9.46	7.84		2.10		0.04	
	DB	75.78	74.15		0.49		-0.01	
	EB	2.29	1.15		-0.91		-0.03	
	MM	9.21	13.30		0.44		0.02	
	Sub.	100.00	100.00	1.42	0.73	0.99	0.00	1.17
Feb-06	DS	3.24	3.57		3.31		-0.02	
	GS	10.16	7.84		1.03		0.04	
	DB	77.24	74.15		-0.31		-0.02	
	EB	2.36	1.15		-0.59		-0.01	
	MM	7.00	13.30		0.41		-0.04	
	Sub.	100.00	100.00	0.27	0.02	1.00	-0.05	0.48
Mar-06	DS	3.05	3.57		16.99		-0.15	
	GS	8.90	7.84		0.55		0.01	
	DB	78.12	74.15		-1.20		-0.07	
	EB	2.14	1.15		-1.19		-0.02	
	MM	7.79	13.30		0.39		-0.06	
	Sub.	100.00	100.00	0.53	-0.20	1.00	-0.28	1.52

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Apr-06	DS	7.86	3.57		7.10		0.58	
	GS	8.04	7.84		-1.33		0.00	
	DB	73.70	74.15		-1.29		0.00	
	EB	2.59	1.15		-1.21		-0.01	
	MM	7.82	13.30		0.36		-0.11	
	Sub.	100.00	100.00	-0.86	-0.78	1.01	0.46	-0.61
May-06	DS	7.80	3.57		-0.36		0.01	
	GS	7.43	7.84		-6.03		0.04	
	DB	73.27	74.15		-0.14		-0.01	
	EB	3.12	1.15		-0.21		0.01	
	MM	8.38	13.30		0.40		-0.08	
	Sub.	100.00	100.00	-0.55	-0.54	1.01	-0.02	0.01
Jun-06	DS	8.67	3.57		14.05		1.18	
	GS	6.65	7.84		2.44		-0.04	
	DB	74.37	74.15		-0.62		0.00	
	EB	2.45	1.15		-0.27		-0.01	
	MM	7.86	13.30		0.40		-0.01	
	Sub.	100.00	100.00	1.19	0.28	0.99	1.11	0.42
Jul-06	DS	7.32	3.57		6.30		0.35	
	GS	6.76	7.84		-0.61		0.03	
	DB	71.60	74.15		0.73		0.00	
	EB	2.21	1.15		1.10		0.01	
	MM	12.12	13.30		0.40		0.01	
	Sub.	100.00	100.00	0.93	0.78	0.99	0.39	-0.14
Aug-06	DS	8.17	3.57		2.98		0.10	
	GS	6.93	7.84		2.31		-0.01	
	DB	76.80	74.15		1.69		0.00	
	EB	0.92	1.15		1.97		0.00	
	MM	7.19	13.30		0.39		0.13	
	Sub.	100.00	100.00	1.57	1.62	0.98	0.22	-0.30
Sep-06	DS	7.47	3.57		-0.29		-0.08	
	GS	6.61	7.84		3.40		-0.05	
	DB	75.43	74.15		0.80		0.00	
	EB	0.59	1.15		1.54		-0.01	
	MM	9.90	13.30		0.39		0.03	
	Sub.	100.00	100.00	0.43	0.92	0.99	-0.11	-0.71
Oct-06	DS	7.65	3.57		6.38		0.38	
	GS	6.70	7.84		3.05		-0.04	
	DB	75.50	74.15		0.40		-0.01	
	EB	0.89	1.15		0.13		0.00	
	MM	9.26	13.30		0.36		0.03	
	Sub.	100.00	100.00	1.08	0.81	0.99	0.36	0.08
Nov-06	DS	5.25	3.57		0.30		0.00	
	GS	5.98	7.84		-1.40		0.05	
	DB	74.34	74.15		0.45		0.00	
	EB	2.21	1.15		0.02		0.00	
	MM	12.24	13.30		0.37		0.00	
	Sub.	100.00	100.00	0.60	0.29	1.00	0.05	0.49

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Dec-06	DS	6.87	3.57		18.46		0.99	
	GS	6.13	7.84		2.10		-0.04	
	DB	76.65	74.15		-0.16		-0.04	
	EB	1.96	1.15		-1.06		-0.02	
	MM	8.39	13.30		0.38		0.03	
	Sub.	100.00	100.00	0.84	0.75	0.99	0.91	-0.76
Jan-07	DS	9.64	15.81		17.48		-1.48	
	GS	6.58	8.71		3.22		-0.01	
	DB	76.06	67.29		-0.04		-0.45	
	EB	1.82	1.26		-0.04		-0.03	
	MM	5.90	6.94		0.33		0.05	
	Sub.	100.00	100.00	1.34	3.04	0.98	-1.92	-0.91
Feb-07	DS	14.47	15.81		1.17		-0.01	
	GS	6.83	8.71		-2.76		0.10	
	DB	70.46	67.29		0.81		0.02	
	EB	1.47	1.26		0.69		0.00	
	MM	6.76	6.94		0.33		0.00	
	Sub.	100.00	100.00	1.31	0.52	0.99	0.11	1.22
Mar-07	DS	14.18	15.81		11.88		-0.26	
	GS	6.29	8.71		1.46		0.03	
	DB	72.69	67.29		0.43		-0.17	
	EB	1.04	1.26		0.07		0.01	
	MM	5.79	6.94		0.40		0.04	
	Sub.	100.00	100.00	1.52	2.33	0.98	-0.35	-0.99
Apr-07	DS	16.07	15.81		9.13		0.03	
	GS	7.05	8.71		1.99		-0.01	
	DB	71.02	67.29		0.12		-0.10	
	EB	1.05	1.26		-0.30		0.01	
	MM	4.80	6.94		0.37		0.05	
	Sub.	100.00	100.00	1.74	1.72	0.98	-0.02	0.05
May-07	DS	17.05	15.81		8.15		0.15	
	GS	7.54	8.71		3.28		-0.05	
	DB	68.16	67.29		-0.89		-0.03	
	EB	1.56	1.26		-1.99		-0.02	
	MM	5.68	6.94		0.36		0.01	
	Sub.	100.00	100.00	0.34	0.98	0.99	0.08	-1.16
Jun-07	DS	16.93	15.81		-2.60		-0.03	
	GS	8.41	8.71		-1.08		0.00	
	DB	65.96	67.29		-0.52		-0.01	
	EB	1.49	1.26		-0.63		0.00	
	MM	7.21	6.94		0.40		0.01	
	Sub.	100.00	100.00	-0.23	-0.84	1.01	-0.03	1.06
Jul-07	DS	17.44	15.81		4.49		0.10	
	GS	7.43	8.71		-3.75		0.10	
	DB	63.86	67.29		0.40		0.02	
	EB	2.13	1.26		1.36		0.01	
	MM	9.14	6.94		0.42		-0.01	
	Sub.	100.00	100.00	0.46	0.70	0.99	0.22	-0.62

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Aug-07	DS	17.13	15.81		-5.31		-0.11	
	GS	7.94	8.71		0.58		-0.02	
	DB	65.95	67.29		0.20		-0.02	
	EB	0.68	1.26		1.20		-0.02	
	MM	8.30	6.94		0.45		0.02	
	Sub.	100.00	100.00	-0.43	-0.61	1.01	-0.13	0.43
Sep-07	DS	14.58	15.81		6.08		-0.11	
	GS	7.95	8.71		0.16		0.01	
	DB	67.11	67.29		-0.15		0.00	
	EB	0.60	1.26		-0.51		0.02	
	MM	9.77	6.94		0.40		-0.02	
	Sub.	100.00	100.00	0.93	0.90	0.99	-0.10	0.15
Oct-07	DS	18.98	15.81		1.97		0.03	
	GS	6.64	8.71		2.46		-0.04	
	DB	64.78	67.29		1.13		0.01	
	EB	0.53	1.26		1.74		0.00	
	MM	9.07	6.94		0.51		-0.03	
	Sub.	100.00	100.00	1.30	1.34	0.99	-0.03	-0.04
Nov-07	DS	21.71	15.81		-8.87		-0.61	
	GS	5.65	8.71		-6.80		0.21	
	DB	65.66	67.29		-1.43		-0.04	
	EB	0.31	1.26		0.14		-0.05	
	MM	6.67	6.94		0.44		-0.02	
	Sub.	100.00	100.00	-2.68	-2.93	1.03	-0.51	0.95
Dec-07	DS	17.61	15.81		12.77		0.31	
	GS	5.00	8.71		-0.83		0.20	
	DB	67.77	67.29		0.69		-0.01	
	EB	0.26	1.26		-0.15		0.04	
	MM	9.36	6.94		0.49		-0.08	
	Sub.	100.00	100.00	2.06	2.44	0.98	0.46	-1.09
Jan-08	DS	26.95	15.81		-13.95		-2.02	
	GS	3.88	8.71		-9.29		0.48	
	DB	65.08	67.29		-1.05		-0.10	
	EB	0.25	1.26		1.32		-0.09	
	MM	3.84	6.94		0.51		-0.23	
	Sub.	100.00	100.00	-3.69	-3.67	1.04	-1.96	1.93
Feb-08	DS	25.26	15.81		-5.66		-0.83	
	GS	3.78	8.71		-2.07		0.13	
	DB	66.48	67.29		0.80		-0.02	
	EB	0.25	1.26		0.91		-0.02	
	MM	4.22	6.94		0.47		-0.04	
	Sub.	100.00	100.00	-0.50	-0.49	1.00	-0.79	0.78
Mar-08	DS	22.70	15.81		-8.92		-0.83	
	GS	3.33	8.71		-5.66		0.35	
	DB	66.32	67.29		-0.07		-0.03	
	EB	0.25	1.26		-0.89		-0.02	
	MM	7.40	6.94		0.45		0.02	
	Sub.	100.00	100.00	-1.25	-1.93	1.02	-0.52	1.68

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Apr-08	DS	22.44	15.81		-1.12		-0.24	
	GS	5.28	8.71		6.89		-0.34	
	DB	66.60	67.29		0.80		0.00	
	EB	0.25	1.26		-0.52		0.03	
	MM	5.43	6.94		0.43		0.01	
	Sub.	100.00	100.00	-0.12	0.99	1.00	-0.54	-1.33
May-08	DS	22.02	15.81		5.41		0.46	
	GS	5.48	8.71		1.80		-0.04	
	DB	65.81	67.29		-0.07		0.03	
	EB	0.24	1.26		-1.51		0.04	
	MM	6.45	6.94		0.46		0.00	
	Sub.	100.00	100.00	1.89	0.98	0.99	0.49	1.04
Jun-08	DS	22.47	15.81		-9.82		-0.85	
	GS	5.58	8.71		-9.60		0.39	
	DB	62.99	67.29		-0.16		-0.17	
	EB	0.79	1.26		-1.10		-0.01	
	MM	8.17	6.94		0.45		0.06	
	Sub.	100.00	100.00	-1.59	-2.48	1.02	-0.58	2.13
Jul-08	DS	20.58	15.81		1.65		0.10	
	GS	5.09	8.71		-1.63		0.12	
	DB	62.51	67.29		0.29		0.01	
	EB	1.08	1.26		1.72		0.00	
	MM	10.75	6.94		0.47		0.01	
	Sub.	100.00	100.00	0.80	0.37	0.99	0.23	0.50
Aug-08	DS	23.35	15.81		-3.68		-0.45	
	GS	5.70	8.71		3.40		-0.18	
	DB	61.17	67.29		0.09		-0.03	
	EB	1.04	1.26		0.32		0.00	
	MM	8.73	6.94		0.47		0.02	
	Sub.	100.00	100.00	-0.63	-0.19	1.00	-0.64	-0.11
Sep-08	DS	23.75	15.81		-14.21		-1.52	
	GS	5.39	8.71		-10.04		0.39	
	DB	60.49	67.29		-0.27		-0.36	
	EB	0.69	1.26		-0.10		-0.03	
	MM	9.68	6.94		0.46		0.18	
	Sub.	100.00	100.00	-3.15	-3.27	1.03	-1.34	1.56
Oct-08	DS	22.17	15.81		-26.53		-2.20	
	GS	5.21	8.71		-10.65		0.20	
	DB	61.26	67.29		-3.52		-0.43	
	EB	0.68	1.26		2.03		-0.10	
	MM	10.68	6.94		0.62		0.54	
	Sub.	100.00	100.00	-4.52	-7.42	1.06	-1.97	7.20
Nov-08	DS	15.07	15.81		-26.49		0.27	
	GS	4.41	8.71		-5.29		-0.04	
	DB	65.97	67.29		-1.90		-0.09	
	EB	2.77	1.26		2.99		0.24	
	MM	11.77	6.94		0.71		0.56	
	Sub.	100.00	100.00	-2.93	-5.84	1.05	0.94	4.23

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Dec-08	DS	13.13	15.81		7.42		-0.16	
	GS	4.27	8.71		-3.94		0.57	
	DB	75.57	67.29		4.34		0.07	
	EB	2.40	1.26		3.89		0.00	
	MM	4.63	6.94		0.68		0.12	
	Sub.	100.00	100.00	2.28	3.84	0.97	0.60	-3.19
Jan-09	DS	13.92	15.81		-2.11		0.06	
	GS	4.34	8.71		1.30		-0.12	
	DB	73.65	67.29		-0.17		0.01	
	EB	2.26	1.26		-0.46		0.00	
	MM	5.84	6.94		0.67		-0.02	
	Sub.	100.00	100.00	-0.30	-0.29	1.00	-0.07	0.07
Feb-09	DS	13.40	15.81		-17.52		0.60	
	GS	3.40	8.71		-8.44		0.49	
	DB	72.23	67.29		0.41		0.31	
	EB	2.48	1.26		1.20		0.09	
	MM	8.49	6.94		0.91		0.11	
	Sub.	100.00	100.00	-1.57	-3.15	1.02	1.60	1.14
Mar-09	DS	12.19	15.81		5.15		-0.25	
	GS	2.66	8.71		4.25		-0.33	
	DB	72.68	67.29		-0.44		-0.13	
	EB	2.48	1.26		1.95		0.02	
	MM	9.98	6.94		1.12		0.01	
	Sub.	100.00	100.00	1.25	0.99	0.99	-0.69	1.13
Apr-09	DS	11.78	15.81		10.08		-0.53	
	GS	3.06	8.71		10.24		-0.77	
	DB	72.44	67.29		-0.66		-0.24	
	EB	2.71	1.26		0.25		-0.04	
	MM	10.01	6.94		0.81		-0.07	
	Sub.	100.00	100.00	1.89	2.10	0.98	-1.65	1.31
May-09	DS	12.55	15.81		34.89		-1.51	
	GS	3.52	8.71		1.17		0.44	
	DB	70.45	67.29		1.07		-0.27	
	EB	2.73	1.26		-2.58		-0.21	
	MM	10.76	6.94		0.77		-0.35	
	Sub.	100.00	100.00	2.65	6.36	0.96	-1.90	-4.13
Jun-09	DS	15.31	15.81		-11.34		0.08	
	GS	2.78	8.71		-0.45		-0.16	
	DB	67.84	67.29		-0.40		0.02	
	EB	1.94	1.26		0.75		0.03	
	MM	12.13	6.94		0.73		0.25	
	Sub.	100.00	100.00	-1.33	-2.04	1.02	0.21	1.02
Jul-09	DS	13.65	15.81		-0.67		0.09	
	GS	3.56	8.71		8.58		-0.58	
	DB	68.95	67.29		1.66		-0.01	
	EB	2.02	1.26		2.33		0.01	
	MM	11.81	6.94		0.78		-0.09	
	Sub.	100.00	100.00	1.14	1.84	0.99	-0.57	-0.60

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Aug-09	DS	13.76	15.81		7.19		-0.16	
	GS	4.92	8.71		2.08		0.02	
	DB	65.46	67.29		1.60		0.03	
	EB	2.08	1.26		0.36		-0.03	
	MM	13.78	6.94		0.79		-0.19	
	Sub.	100.00	100.00	1.55	2.46	0.98	-0.33	-1.18
Sep-09	DS	14.65	15.81		9.65		-0.13	
	GS	4.53	8.71		1.79		0.09	
	DB	63.77	67.29		1.91		0.06	
	EB	2.17	1.26		0.09		-0.04	
	MM	14.88	6.94		0.76		-0.30	
	Sub.	100.00	100.00	2.09	3.02	0.98	-0.32	-1.22
Oct-09	DS	16.40	15.81		-2.15		-0.02	
	GS	3.95	8.71		-4.37		0.34	
	DB	61.38	67.29		0.71		-0.09	
	EB	2.12	1.26		-0.71		-0.01	
	MM	16.16	6.94		0.72		0.14	
	Sub.	100.00	100.00	0.35	-0.20	1.00	0.36	0.58
Nov-09	DS	16.69	15.81		-3.39		-0.09	
	GS	4.00	8.71		4.91		-0.17	
	DB	61.04	67.29		4.21		-0.15	
	EB	3.69	1.26		1.91		-0.04	
	MM	14.58	6.94		0.67		-0.27	
	Sub.	100.00	100.00	1.21	2.80	0.98	-0.71	-1.94
Dec-09	DS	17.37	15.81		-2.80		-0.10	
	GS	4.77	8.71		5.60		-0.31	
	DB	59.98	67.29		1.20		-0.04	
	EB	3.37	1.26		-0.95		-0.07	
	MM	14.51	6.94		0.50		-0.05	
	Sub.	100.00	100.00	0.66	0.88	0.99	-0.56	0.19
Jan-10	DS	17.17	15.81		10.22		0.18	
	GS	5.38	8.71		-1.36		0.20	
	DB	59.79	67.29		1.15		0.15	
	EB	3.21	1.26		0.56		-0.06	
	MM	14.44	6.94		0.51		-0.22	
	Sub.	100.00	100.00	2.04	2.31	0.98	0.25	-0.69
Feb-10	DS	18.74	15.81		-2.72		-0.14	
	GS	5.89	8.71		3.46		-0.16	
	DB	58.08	67.29		0.21		-0.03	
	EB	3.01	1.26		0.56		0.02	
	MM	14.29	6.94		0.35		0.04	
	Sub.	100.00	100.00	0.06	0.05	1.00	-0.27	0.30
Mar-10	DS	19.28	15.81		0.47		-0.02	
	GS	6.88	8.71		7.20		-0.20	
	DB	57.66	67.29		0.09		0.11	
	EB	2.92	1.26		0.51		-0.01	
	MM	13.25	6.94		0.38		-0.04	
	Sub.	100.00	100.00	1.82	0.80	0.99	-0.15	1.87

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Apr-10	DS	16.91	15.81		1.11		0.01	
	GS	8.29	8.71		1.52		-0.01	
	DB	62.72	67.29		0.53		0.01	
	EB	2.81	1.26		-0.80		-0.04	
	MM	9.26	6.94		0.35		-0.01	
	Sub.	100.00	100.00	0.35	0.68	0.99	-0.04	-0.52
May-10	DS	16.29	15.81		-7.86		-0.05	
	GS	8.81	8.71		-3.32		0.00	
	DB	62.10	67.29		0.21		-0.14	
	EB	2.43	1.26		1.76		0.06	
	MM	10.36	6.94		0.35		0.10	
	Sub.	100.00	100.00	-0.81	-1.34	1.01	-0.03	0.94
Jun-10	DS	15.81	15.81		-6.37		0.00	
	GS	9.39	8.71		-2.69		0.00	
	DB	62.53	67.29		-1.71		-0.06	
	EB	2.05	1.26		-1.71		0.01	
	MM	10.23	6.94		0.27		0.15	
	Sub.	100.00	100.00	-1.16	-2.39	1.02	0.10	2.03
Jul-10	DS	14.60	15.81		0.32		0.02	
	GS	9.28	8.71		2.23		0.01	
	DB	60.33	67.29		1.46		-0.02	
	EB	1.86	1.26		1.76		0.00	
	MM	13.94	6.94		0.34		-0.11	
	Sub.	100.00	100.00	1.46	1.27	0.99	-0.10	0.41
Aug-10	DS	14.23	15.81		-0.21		0.03	
	GS	8.13	8.71		-1.27		0.02	
	DB	70.25	67.29		1.45		0.03	
	EB	1.51	1.26		2.76		0.01	
	MM	5.88	6.94		0.35		0.01	
	Sub.	100.00	100.00	1.07	0.89	0.99	0.10	0.22
Sep-10	DS	14.21	15.81		3.91		-0.07	
	GS	8.20	8.71		2.49		-0.01	
	DB	69.43	67.29		0.67		-0.02	
	EB	1.74	1.26		-0.74		-0.02	
	MM	6.43	6.94		0.33		0.01	
	Sub.	100.00	100.00	1.28	1.30	0.99	-0.11	0.08
Oct-10	DS	15.62	15.81		-2.17		0.01	
	GS	9.27	8.71		2.76		0.02	
	DB	67.08	67.29		1.14		0.00	
	EB	1.64	1.26		0.15		0.00	
	MM	6.39	6.94		0.35		0.00	
	Sub.	100.00	100.00	0.84	0.69	0.99	0.03	0.22
Nov-10	DS	15.37	15.81		-4.16		0.03	
	GS	10.88	8.71		3.59		0.13	
	DB	66.56	67.29		0.65		-0.01	
	EB	1.47	1.26		-1.61		-0.01	
	MM	5.71	6.94		0.33		0.00	
	Sub.	100.00	100.00	0.40	0.10	1.00	0.14	0.37

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Dec-10	DS	14.67	15.81		18.41		-0.28	
	GS	10.17	8.71		6.30		0.07	
	DB	69.67	67.29		-0.35		-0.14	
	EB	1.08	1.26		-0.92		0.01	
	MM	4.41	6.94		0.30		0.12	
	Sub.	100.00	100.00	2.01	3.23	0.97	-0.22	-1.80
Jan-11	DS	18.35	15.81		8.88		0.31	
	GS	10.87	8.71		-0.95		-0.09	
	DB	66.56	67.29		0.48		0.01	
	EB	1.00	1.26		-0.10		0.01	
	MM	3.21	6.94		0.31		0.08	
	Sub.	100.00	100.00	1.76	1.66	0.98	0.32	-0.15
Feb-11	DS	19.10	15.81		-2.00		-0.13	
	GS	10.45	8.71		3.19		0.08	
	DB	64.86	67.29		0.64		-0.01	
	EB	0.97	1.26		0.01		0.00	
	MM	4.62	6.94		0.28		0.01	
	Sub.	100.00	100.00	0.09	0.41	1.00	-0.06	-0.49
Mar-11	DS	18.46	15.81		2.46		0.08	
	GS	10.85	8.71		-3.43		-0.15	
	DB	64.08	67.29		1.00		-0.01	
	EB	0.97	1.26		-1.10		0.01	
	MM	5.65	6.94		0.32		0.01	
	Sub.	100.00	100.00	1.17	0.77	0.99	-0.07	0.73
Apr-11	DS	18.48	15.81		-2.22		-0.10	
	GS	13.82	8.71		-1.65		-0.13	
	DB	63.60	67.29		0.54		-0.04	
	EB	0.93	1.26		-0.23		0.00	
	MM	3.18	6.94		0.31		-0.03	
	Sub.	100.00	100.00	0.15	-0.11	1.00	-0.30	0.75
May-11	DS	18.63	15.81		2.27		0.02	
	GS	13.94	8.71		2.99		0.11	
	DB	63.28	67.29		1.67		0.01	
	EB	0.91	1.26		2.06		0.00	
	MM	3.24	6.94		0.27		0.09	
	Sub.	100.00	100.00	1.28	1.78	0.98	0.23	-1.07
Jun-11	DS	18.89	15.81		-1.86		-0.05	
	GS	14.35	8.71		-3.02		-0.21	
	DB	62.63	67.29		-0.43		-0.03	
	EB	0.91	1.26		-1.23		0.00	
	MM	3.22	6.94		0.24		-0.07	
	Sub.	100.00	100.00	-0.32	-0.84	1.01	-0.36	1.26
Jul-11	DS	17.51	15.81		-2.32		-0.06	
	GS	13.59	8.71		-0.11		0.02	
	DB	61.28	67.29		-0.07		-0.03	
	EB	0.87	1.26		1.25		-0.01	
	MM	6.76	6.94		0.23		0.00	
	Sub.	100.00	100.00	-0.21	-0.39	1.00	-0.08	0.39

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Aug-11	DS	17.06	15.81		-6.20		-0.09	
	GS	11.50	8.71		-7.62		-0.27	
	DB	67.69	67.29		-0.55		0.01	
	EB	0.37	1.26		2.89		-0.07	
	MM	3.37	6.94		0.25		-0.14	
	Sub.	100.00	100.00	-2.21	-1.96	1.02	-0.57	0.13
Sep-11	DS	16.70	15.81		-8.60		-0.11	
	GS	11.46	8.71		-3.17		-0.07	
	DB	68.16	67.29		-0.09		0.02	
	EB	0.38	1.26		0.64		-0.03	
	MM	3.31	6.94		0.26		-0.12	
	Sub.	100.00	100.00	-1.74	-1.67	1.02	-0.31	0.18
Oct-11	DS	17.05	15.81		-0.39		-0.02	
	GS	10.84	8.71		6.10		0.20	
	DB	68.64	67.29		-0.08		-0.01	
	EB	0.35	1.26		-2.02		0.04	
	MM	3.12	6.94		0.29		0.01	
	Sub.	100.00	100.00	0.93	0.41	0.99	0.22	0.65
Nov-11	DS	16.84	15.81		-5.38		-0.06	
	GS	9.65	8.71		3.22		0.09	
	DB	67.75	67.29		-2.20		0.00	
	EB	0.33	1.26		-2.79		0.01	
	MM	5.44	6.94		0.33		-0.06	
	Sub.	100.00	100.00	-1.66	-2.06	1.02	-0.02	0.72
Dec-11	DS	16.40	15.81		0.31		-0.01	
	GS	10.42	8.71		4.08		0.07	
	DB	66.62	67.29		1.84		0.00	
	EB	0.33	1.26		4.30		-0.04	
	MM	6.23	6.94		0.34		0.02	
	Sub.	100.00	100.00	1.37	1.72	0.98	0.03	-0.61
Jan-12	DS	16.06	15.81		-0.49		0.00	
	GS	11.85	8.71		4.03		0.18	
	DB	67.47	67.29		0.48		0.00	
	EB	0.33	1.26		2.20		-0.02	
	MM	4.29	6.94		0.35		0.01	
	Sub.	100.00	100.00	1.07	0.65	0.99	0.16	0.55
Feb-12	DS	15.30	15.81		3.73		-0.01	
	GS	10.37	8.71		2.50		0.01	
	DB	67.30	67.29		2.14		0.00	
	EB	0.33	1.26		2.03		0.00	
	MM	6.70	6.94		0.37		0.01	
	Sub.	100.00	100.00	1.19	2.30	0.98	0.01	-1.84
Mar-12	DS	14.51	15.81		2.85		-0.02	
	GS	10.21	8.71		1.10		-0.02	
	DB	68.79	67.29		1.93		0.00	
	EB	0.32	1.26		-0.82		0.04	
	MM	6.17	6.94		0.38		0.02	
	Sub.	100.00	100.00	0.78	1.86	0.99	0.02	-1.83

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Apr-12	DS	14.60	15.81		-1.54		0.05	
	GS	9.82	8.71		0.13		-0.01	
	DB	68.13	67.29		1.63		0.01	
	EB	0.31	1.26		0.28		0.01	
	MM	7.13	6.94		0.38		0.00	
	Sub.	100.00	100.00	0.95	0.89	0.99	0.05	0.04
May-12	DS	14.25	15.81		-7.12		0.17	
	GS	10.39	8.71		-2.59		-0.06	
	DB	70.11	67.29		1.11		0.08	
	EB	0.44	1.26		1.39		-0.03	
	MM	4.92	6.94		0.40		-0.03	
	Sub.	100.11	100.00	-0.69	-0.56	1.01	0.14	-0.37
Jun-12	DS	13.42	15.81		1.78		-0.04	
	GS	10.56	8.71		3.36		0.08	
	DB	71.25	67.29		0.32		-0.03	
	EB	0.43	1.26		-1.26		0.03	
	MM	4.33	6.94		0.36		0.02	
	Sub.	100.00	100.00	0.77	0.79	0.99	0.06	-0.10
Jul-12	DS	13.58	15.81		0.51		0.02	
	GS	10.13	8.71		3.87		0.07	
	DB	70.05	67.29		0.82		-0.01	
	EB	0.42	1.26		1.74		-0.01	
	MM	5.81	6.94		0.30		0.01	
	Sub.	100.00	100.00	1.46	1.02	0.99	0.08	0.67
Aug-12	DS	12.87	15.81		-0.83		0.07	
	GS	10.24	8.71		-0.25		-0.02	
	DB	71.07	67.29		0.98		0.03	
	EB	0.36	1.26		0.39		0.00	
	MM	5.46	6.94		0.30		0.01	
	Sub.	100.00	100.00	0.68	0.53	0.99	0.08	0.17
Sep-12	DS	13.15	15.81		2.36		0.02	
	GS	8.84	8.71		-0.72		-0.01	
	DB	71.37	67.29		3.73		0.06	
	EB	0.44	1.26		0.88		0.03	
	MM	6.20	6.94		0.31		0.03	
	Sub.	100.00	100.00	3.30	2.85	0.97	0.13	0.61
Oct-12	DS	13.50	15.81		2.56		-0.01	
	GS	10.52	8.71		0.34		-0.06	
	DB	69.26	67.29		2.57		0.01	
	EB	0.42	1.26		2.03		0.00	
	MM	6.29	6.94		0.31		0.02	
	Sub.	100.00	100.00	1.86	2.21	0.98	-0.03	-0.55
Nov-12	DS	13.39	15.81		0.56		0.00	
	GS	9.87	8.71		1.24		0.01	
	DB	68.83	67.29		0.48		0.00	
	EB	0.41	1.26		1.74		-0.02	
	MM	7.49	6.94		0.25		0.00	
	Sub.	100.00	100.00	0.52	0.56	0.99	-0.01	-0.06

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Dec-12	DS	13.56	15.81		-0.88		0.05	
	GS	11.16	8.71		0.35		0.00	
	DB	67.71	67.29		0.78		0.00	
	EB	0.41	1.26		0.82		-0.01	
	MM	7.17	6.94		0.17		0.00	
	Sub.	100.00	100.00	0.34	0.44	1.00	0.04	-0.21
Jan-13	DS	14.46	15.81		8.74		-0.13	
	GS	10.87	8.71		2.66		-0.01	
	DB	67.47	67.29		1.77		0.00	
	EB	0.41	1.26		0.09		0.04	
	MM	6.79	6.94		0.23		0.01	
	Sub.	100.00	100.00	2.47	2.82	0.97	-0.10	-0.48
Feb-13	DS	14.99	15.81		3.31		-0.04	
	GS	12.23	8.71		3.77		0.20	
	DB	65.61	67.29		-0.76		0.03	
	EB	0.39	1.26		0.30		0.00	
	MM	6.77	6.94		0.20		0.00	
	Sub.	100.00	100.00	-0.05	0.36	1.00	0.20	-0.88
Mar-13	DS	15.33	15.81		3.47		-0.02	
	GS	12.77	8.71		4.51		0.24	
	DB	65.24	67.29		0.01		0.03	
	EB	0.50	1.26		0.54		0.01	
	MM	6.16	6.94		0.20		0.01	
	Sub.	100.00	100.00	0.31	0.97	0.99	0.27	-1.37
Apr-13	DS	14.43	15.81		-2.72		0.08	
	GS	11.61	8.71		1.28		0.02	
	DB	65.35	67.29		1.55		-0.03	
	EB	0.24	1.26		2.80		-0.03	
	MM	8.37	6.94		0.19		-0.01	
	Sub.	100.00	100.00	1.03	0.77	0.99	0.03	0.40
May-13	DS	14.80	15.81		-4.61		0.06	
	GS	11.63	8.71		0.89		0.10	
	DB	68.08	67.29		-0.64		0.01	
	EB	0.24	1.26		-1.77		0.01	
	MM	5.25	6.94		0.17		-0.04	
	Sub.	100.00	100.00	-0.67	-1.09	1.01	0.14	0.57
Jun-13	DS	14.71	15.81		-2.41		-0.01	
	GS	10.56	8.71		-5.04		-0.08	
	DB	67.28	67.29		-2.74		0.00	
	EB	1.49	1.26		-2.93		0.00	
	MM	5.95	6.94		0.16		-0.05	
	Sub.	100.00	100.00	-2.15	-2.69	1.02	-0.13	1.08
Jul-13	DS	13.46	15.81		2.69		-0.02	
	GS	10.60	8.71		4.14		0.06	
	DB	66.15	67.29		2.13		0.00	
	EB	1.41	1.26		1.33		0.00	
	MM	8.39	6.94		0.18		-0.05	
	Sub.	100.00	100.00	2.33	2.25	0.98	-0.01	0.15

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Aug-13	DS	12.85	15.81		-0.14		0.00	
	GS	10.90	8.71		-1.04		-0.03	
	DB	72.19	67.29		-0.14		0.00	
	EB	1.50	1.26		0.22		0.00	
	MM	2.55	6.94		0.18		-0.03	
	Sub.	100.00	100.00	0.03	-0.19	1.00	-0.06	0.45
Sep-13	DS	12.79	15.81		-1.43		0.12	
	GS	10.67	8.71		3.80		0.10	
	DB	72.55	67.29		1.12		0.02	
	EB	1.49	1.26		1.61		0.00	
	MM	2.50	6.94		0.17		0.05	
	Sub.	100.00	100.00	0.53	0.89	0.99	0.29	-0.89
Oct-13	DS	12.82	15.81		-2.30		0.13	
	GS	10.64	8.71		1.99		0.06	
	DB	71.83	67.29		0.64		0.03	
	EB	1.48	1.26		1.60		0.00	
	MM	3.24	6.94		0.18		0.01	
	Sub.	100.00	100.00	0.31	0.27	1.00	0.23	-0.16
Nov-13	DS	12.67	15.81		0.69		0.00	
	GS	9.99	8.71		3.06		0.05	
	DB	71.73	67.29		0.57		-0.02	
	EB	1.66	1.26		0.46		0.00	
	MM	3.95	6.94		0.17		0.03	
	Sub.	100.00	100.00	0.69	0.77	0.99	0.07	-0.22
Dec-13	DS	13.22	15.81		1.50		-0.06	
	GS	10.38	8.71		1.04		0.03	
	DB	71.37	67.29		-0.32		-0.03	
	EB	1.81	1.26		-0.54		-0.01	
	MM	3.22	6.94		0.17		0.00	
	Sub.	100.00	100.00	0.21	0.12	1.00	-0.07	0.23
Jan-14	DS	12.40	15.81		0.77		-0.01	
	GS	11.33	8.71		-2.49		-0.13	
	DB	69.27	67.29		0.84		0.01	
	EB	1.80	1.26		2.48		0.02	
	MM	5.19	6.94		0.17		0.01	
	Sub.	100.00	100.00	0.44	0.51	1.00	-0.11	-0.02
Feb-14	DS	14.06	15.81		-0.22		0.06	
	GS	10.45	8.71		4.82		0.08	
	DB	68.53	67.29		2.19		0.01	
	EB	2.22	1.26		0.88		-0.02	
	MM	4.74	6.94		0.18		0.06	
	Sub.	100.00	100.00	2.50	1.88	0.98	0.20	0.84
Mar-14	DS	12.09	15.81		-1.95		0.12	
	GS	10.77	8.71		-0.45		-0.02	
	DB	72.60	67.29		0.45		0.04	
	EB	2.40	1.26		1.00		0.02	
	MM	2.15	6.94		0.18		-0.02	
	Sub.	100.00	100.00	-0.10	-0.02	1.00	0.15	-0.29

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Apr-14	DS	11.87	15.81		-2.11		0.15	
	GS	10.84	8.71		-0.62		-0.03	
	DB	72.54	67.29		0.75		0.06	
	EB	1.58	1.26		0.27		0.00	
	MM	3.17	6.94		0.16		0.00	
	Sub.	100.00	100.00	0.18	0.13	1.00	0.18	-0.10
May-14	DS	11.89	15.81		1.46		0.00	
	GS	10.94	8.71		3.63		0.08	
	DB	71.32	67.29		1.33		-0.01	
	EB	1.65	1.26		0.72		0.00	
	MM	4.19	6.94		0.16		0.06	
	Sub.	100.00	100.00	1.96	1.46	0.98	0.13	0.71
Jun-14	DS	12.27	15.81		5.45		-0.22	
	GS	11.54	8.71		1.56		-0.01	
	DB	71.34	67.29		1.15		-0.04	
	EB	1.40	1.26		0.89		0.00	
	MM	3.45	6.94		0.16		0.10	
	Sub.	100.00	100.00	1.63	1.79	0.98	-0.18	-0.09
Jul-14	DS	11.70	15.81		1.48		-0.04	
	GS	12.34	8.71		0.81		-0.01	
	DB	72.91	67.29		0.84		-0.01	
	EB	3.19	1.26		1.81		0.03	
	MM	1.75	6.94		0.17		0.06	
	Sub.	101.89	100.00	0.73	0.91	0.99	0.04	-0.35
Aug-14	DS	11.76	15.81		2.07		-0.08	
	GS	12.24	8.71		3.80		0.17	
	DB	71.11	67.29		0.24		-0.04	
	EB	1.09	1.26		1.68		0.00	
	MM	3.80	6.94		0.16		0.04	
	Sub.	100.00	100.00	0.84	0.85	0.99	0.09	-0.11
Sep-14	DS	12.20	15.81		3.86		-0.13	
	GS	12.64	8.71		1.13		-0.04	
	DB	70.85	67.29		1.46		-0.01	
	EB	0.99	1.26		0.10		0.01	
	MM	3.33	6.94		0.16		0.09	
	Sub.	100.00	100.00	1.83	1.70	0.98	-0.08	0.30
Oct-14	DS	12.55	15.81		-4.14		0.22	
	GS	13.07	8.71		1.87		0.15	
	DB	69.81	67.29		0.52		0.03	
	EB	0.99	1.26		0.71		0.00	
	MM	3.59	6.94		0.15		-0.02	
	Sub.	100.00	100.00	0.11	-0.12	1.00	0.38	0.01
Nov-14	DS	12.05	15.81		-2.54		0.20	
	GS	13.79	8.71		3.27		0.22	
	DB	69.78	67.29		1.11		0.02	
	EB	0.73	1.26		1.44		-0.01	
	MM	3.65	6.94		0.15		0.03	
	Sub.	100.00	100.00	0.71	0.66	0.99	0.47	-0.37

		$w_{p,i}$ (%)	$w_{b,i}$ (%)	r_p (%)	$r_{b,i}$ (%)	C_f	All_i (%)	Sel (%)
Dec-14	DS	12.05	15.81		-2.60		0.14	
	GS	13.99	8.71		0.60		0.09	
	DB	68.16	67.29		-0.02		0.00	
	EB	0.71	1.26		0.69		-0.01	
	MM	5.09	6.94		0.15		-0.02	
	Sub.	100.00	100.00	0.19	-0.35	1.00	0.21	0.71
2005 - 2014	DS						-8.67	
	GS						2.81	
	DB						-2.61	
	EB						-0.58	
	MM						1.03	
	Total	**0.00**	**0.00**	**76.00**	**63.73**	**0.59**	**-8.01**	**20.28**

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Implications of the taxation of tobacco in the European Union in the period 2005-2014

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Review article**
JEL: H2
doi: 10.3326/fintp.39.3.2

* The author would like to thank three anonymous referees for their useful comments and suggestions.
** Received: February 3, 2015
Accepted: April 24, 2015

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FINANCIAL THEORY AND PRACTICE
39 (3) 279-304 (2015)

Abstract

The paper aims to analyze the implications of excise policy in member states and at the EU level in the period 2005-2014 in the field of tobacco taxation for policy convergence, revenues and the tobacco market. Based on statistical measures of variability, the convergence of the excise policies of EU member states in the field of the taxation of cigarettes is determined, with the proviso that the excise policies of the new member states are more homogenous than those of the EU-15. From trends in the consumption of tobacco products it can be concluded that the policy that was based on the premise of increasing the excise burden on cigarettes while maintaining a low excise duty on fine cut tobacco led in most member states to distortions in the tobacco market and loss of excise revenues. The study presented in this paper confirmed the key hypothesis that a coherent and effective excise policy at EU level cannot be achieved without careful balancing the structure, amount and dynamics of the increase in the tax burden on cigarettes and all products that may appear as their substitutes.

Keywords: tobacco taxation, convergence

1 INTRODUCTION

Tobacco and tobacco products are suitable goods for taxation, as indicated even by Adam Smith (1776) in the *The Wealth of Nations*. Since they do not represent basic foodstuffs or are subject to general consumer spending, and there is a strong element of addiction to spending, the taxation of these goods at high rates can bring high revenues. In recent years, high excise rates represent not only an important instrument of fiscal policy, but are also in line with primary health care policy. The World Health Organization (WHO) has promoted an increase in tobacco excises as one of the six most important instruments of MPOWER[1] in order to discourage consumption, especially by high-risk groups and of lower quality tobacco (WHO, 2008). Since tobacco smoking produces negative externalities in terms of impact on the health of smokers and passive smokers, the high revenues obtained from tobacco excises are also used to finance health (Rechel and McKee, 2014).

Given the dominant share of the tobacco market, the main problem in the design of excise duties is the determination of the structure of excise rates on cigarettes, in terms of the relationship between the *ad valorem* and the specific excise duty. This issue is crucial for any country that seeks to eliminate lower quality tobaccos from the market and reduce health risks. For the EU, the structure of excise duties on cigarettes is also important for the process of convergence of the excise policies of EU member states towards the creation of a coherent policy for excise duties at EU level. In the last ten decades, tobacco market trends have indicated

[1] MPOWER stands for: Monitoring tobacco use and prevention policies; Protecting people from tobacco smoke; Offering help to quit tobacco use; Warning about the dangers of tobacco; Enforcing bans on tobacco advertising, promotion and sponsorship; Raising tobacco taxes.

that taxation policies regarding other tobacco products that may appear as substitutes to cigarettes can be of great importance for the creation of an effective excise policy. In recent years, the increasing substitution of fine cut tobacco for cigarettes has led to tobacco market distortions, the growth of the black market and illegal trade resulting in a drop in revenues from excise duties. It is evident that the substitution of fine cut tobacco for cigarettes is becoming a factor that not only threatens the realization of the goals of fiscal and health policy set but also diminishes the results achieved so far in combating tobacco consumption, especially among vulnerable groups and the young.

The paper aims to explore the implications of the excise policy design in the EU and its member states in the field of tobacco products within the period 2005-2014, focusing on the development of a convergence process in the excise policy advocated by the EU and the increasing substitution of fine cut tobacco for cigarettes. The research in this paper aims to confirm the hypothesis that the excise policy of the EU cannot be effective in achieving the economic, fiscal and health goals without a harmonized system of taxation of cigarettes, the main product, and of other tobacco products that may appear as substitutes. The second part of the paper analyzes trends in the taxation of cigarettes, and the third part the level of convergence of excise policies attained at EU level. The fourth section provides an analysis of trends in the tobacco market and in revenues collected from excise duties and the current excise policy consequences in terms of the implications of differentiated excise policies. Directions for redefining the EU excise policy on fine cut tobacco are discussed in the fifth section. The study is based on data for the period 2005-2014 from the CIRCABC[2] database of the European Commission, which contains all the elements of policies of member states EU-27 relevant to the taxation of cigarettes and fine cut tobacco, as well as data on consumption of tobacco products and excise revenues in the specified period[3].

2 REVIEW OF LITERATURE

2.1 ON TOBACCO TAXATION

Principles of taxation in financial theory advocate taxing individual goods by a specific tax per unit of measure. However, there is a deviation in tobacco because in many countries tobacco is traditionally subject to an *ad valorem* excise. Because of the action of the multiplier with the price changes before taxes (i.e. producers' prices) on the increase in selling prices of cigarettes, Crawford, Keen and Smith (IFS, 2010) suggest that the high rates of *ad valorem* excise do not motivate producers to invest in innovation and to use higher quality tobacco. The result is the retention of the existing price range. Excise policy based on an *ad valorem* excise leads to price differentiation, so the increase in excise rate has no greater impact on reducing consumption, as consumers switch to cheaper brands. The logical consequence of high rates policy of *ad valorem* excise duties is the lower

[2] Available at: <https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp/>.
[3] It should be noted that data on excise revenues are available up to and including 2013.

level of revenues from excise duties. On the other hand, high specific excise duties compel producers to seek ways to improve their internal economy, in order at least partially to offset the increase in excise duties by the reduction of prices before the taxation. In such relationships, manufacturers are keen to invest in innovation, equipment and higher quality tobacco, in order to reduce fixed costs per unit and increase the efficiency of their internal economy. Given that a high excise burden leads to high retail prices for cigarettes manufactured from cheaper tobacco, consumers are opting for quality cigarettes. The result is the elimination of cheap tobacco from the market and the reduction of price ranges between the most expensive and the cheapest cigarettes, which prevents the migration of certain categories of consumers, such as those with lower incomes and the young, towards cheaper cigarettes. The collection of excise revenues in this case does not depend on the price policy of companies, but on the consumption of cigarettes. Projections of revenues from excise duties are more certain, given that the effect of price changes is excluded from their calculation. Likewise, the administration of excise duties (control of calculation and collection) is easier with the specific excise duty because it is not necessary to monitor the movement of retail prices. Crawford, Keen and Smith (IFS, 2010) consider that the selection of the type of excise duty on tobacco depends on the preferences of consumers and the market structure, so that the *ad valorem* excise duty will be the choice for a monopoly-structure market and weak production differentiation. However, Chaloupka, Yurekli and Fong (2012) argue that the choice between the *ad valorem* and specific excise duty and the decision concerning which type of excise duty to prefer if using a mixture of excise duties depends on the interests of the state. If the objective is to collect revenues or reduce health risks, then the state will commit to the specific excise duty. On the other hand, if it wants to protect the domestic tobacco industry and the market for cheaper cigarettes, the state will opt for the *ad valorem* excise duty. Presenting a list of reasons "for and against" Yurekli (2001) advocates the concept of "the best of both", i.e. a hybrid rate of excise duty which will combine the advantages of both types of excise duties.

2.2 ON INFLUENCE OF TOBACCO ELASTICITY ON POLICY DESIGN

States turn to higher taxes in the first place to increase the flow of revenues. The high capacity in excise duties on tobacco is the result of the inelasticity of demand for tobacco, so that high income can be achieved even in the situation in which prices increase due to tax rises. According to analyses of the World Bank (1999) a growth of the tax burden of 10% on cigarettes will on average bring a growth of tax revenues from this source of 7%. The increase in the tax burden does not lead to a proportionate increase in revenues, due to income and substitution effects produced by taxes. Higher allocation for taxes inevitably leads to a reduction in consumption, and on the other hand consumers try to avoid the tax burden or reduce it in order to maintain the previous level of consumption. Excessive growth of taxes can produce the opposite effects on the growth of income if the tax burden exceeds the consumer's threshold of tolerance, as the Laffer curve shows. Further

continuation of the policy to increase taxation leads to a serious erosion of revenues, growth of tax evasion and the expansion of the black market. Revenue growth is not also proportional due to the heterogeneity of consumers. The drop in consumption is higher in people with lower incomes, which leads to a smaller increase in revenues from excise duties. According to researches presented in about 100 papers and studies in the past fifty years it can be concluded that most studies from countries with high incomes show price elasticity ranging between -0.25 and -0.5, with most of countries concentrated around -0.4 (Chaloupka et al., 2012). Cnossen (2006) lists Viscusi's overview of results from 41 researches on the effects of cigarette prices on demand, of which 31 apply to the USA and the rest to the UK. The demand elasticity ranged between -0.4 and -1.0 in the US, and in the UK between -0.1 and -0.8. The World Bank research study (1999) showed that demand elasticity for cigarettes is dependent on the level of development of the country. In developed countries with high incomes an average price increase of 10% per pack of cigarettes leads to a drop in consumption of 4%, while in developing countries that belong to the group with low and middle incomes the drop in consumption on average amounts to 8%.

Some studies have come to the conclusion that the elasticity of cigarette consumption varies according to the horizon of observation, income and age structure of consumers. Numerous studies over the last decade have shown that demand for cigarettes is price inelastic in the short term, while in the longer term it shows a greater degree of flexibility (Ramboll, 2014). Furthermore, demand for cigarettes is more elastic in people with low incomes. Analyses of the World Bank (1999) have shown that an increase in cigarette prices to a greater extent affects the poorer rather than richer classes of consumers because of their low incomes, as well as the younger population, which has limited incomes. Chaloupka et al. (2002) cite studies in which it was found that the elasticity of demand for cigarettes of the young depends not only on their income, but also on the prices of other goods consumed by the young. Based on the analysis of trends in the consumption of cigarettes and other goods among the young in the US at the time of a strong growth in the price of automobile fuel, a correlation between a decline in cigarette consumption and an increase in fuel prices can be seen. The explanation of analysts is that young people, when they find themselves in a situation in which they must choose between cigarettes or driving a car, opt for the car and therefore fuel consumption.

These studies of the behavior of young people indicate the importance of cross-elasticity of demand for the design of tobacco excise duties. In conditions of the existence of cross-elasticity of goods, when buying one good depends not only on the price of the good itself, but also on the price of substitute or complementary goods, the state by its tax policy can provide a strong incentive for consumers legally to avoid paying high taxes, while at the same time gaining benefits from the spending they had before the tax increase. This will diminish the expected goals

of tax policy; produce distortions in the market and the allocation of capital in terms of moving demand towards substitutes, as a result of tax measures, and not of the increase in efficiency in their production. Adam Smith (1776) pointed out the harmfulness of the differentiated taxation of substitutes. Starting from the fact that the introduction of various excise duties on beer in England in his time led to harmful tax competition and increased tax revenue collection efforts without any visible fiscal effects, Smith argued for a tax system in which the substitutes are subject to a single tax on consumption.

Empirical studies show that the main trigger for the occurrence of tax evasion in the last two decades was the policy of differentiated taxation of cigarettes and tobacco used for the rolling of cigarettes (the so called RYO tobacco – Roll-Your-Own tobacco). Differentiated taxation of tobacco products has led to the migration of consumers from the market for cigarettes, products characterized by high prices, and consequently, higher taxes, towards the market for fine cut tobacco, a cheaper product, which is less taxed. Townsend (1998) cited the examples of Norway, where an increase in cigarette taxes led to an increase in consumption of manually rolled cigarettes, and Egypt, in which increasing taxes on cigarettes has led to an increase in demand for lower-taxed pipe tobacco (*shisha*). De Beyer and Yurekli (2000) point out that a similar thing happened in Indonesia, which increased taxes on white cigarettes but not on *kreteks*. These researches indicate that the negative effects of the differentiation of excise taxes are amplified in less developed countries with inefficient customs and tax administrations, poor tax discipline, a higher degree of corruption, weak control mechanisms and ineffective sanctions for tax frauds.

An extensive investigation of tax evasion for the European Commission, based on information collected from the customs services and the press, or by interviewing producers and consumers, found that about 13% of revenues from excise duties are lost annually in the EU due to illegal tobacco (Rambell, 2014). Unlike the EU, recent studies of the substitution fine cut tobacco for cigarettes in B&H have been based on actual statistical data on the imports of cigarette paper, after the deduction of the cigarette paper necessary for the domestic tobacco industry, and quantity of tobacco needed for RYO cigarette production (Antić, 2014). The research has shown that the ratio of rolled cigarettes consumption and taxed cigarettes consumption is increasing dramatically year after year. From a negligible 3.6% in 2011, in 2012 it increased by 16% and in 2013 by even 33%. The author concludes that the potential consumption of cigarettes, if all consumers who roll cigarettes switch to taxed cigarettes, would still be lower than the total actual consumption (taxable and non-taxable), because one would have to take into account the limitation of disposable income for the purchase of tobacco and the price difference between cigarettes obtained by rolling and the cheapest taxable brand.

From the practice of Poland it can be concluded that the cigarette market can be stabilized by an adequate excise policy capable of comprehending all cigarette substitutes. The growth in retail cigarette prices, encouraged by the increase in excise duties, produced a strong migration of consumers towards rolled cigarettes. By increasing excise duties on fine cut tobacco Poland only managed to alleviate tax evasion, as consumers switched to the consumption of pipe tobacco which was taxed to a lesser extent compared to cigarettes and fine cut tobacco (WHO, 2011). From the example of Poland it can be concluded that there is always a danger that excise duties will not include, or at least not sufficiently, all the potential substitutes. In terms of technological innovations that result in the rapid growth of the market, as is the case with e-cigarettes, it is necessary precisely to define different "borderline" tobacco products in order to avoid erroneous classification in non-taxable products, and expand the scope of taxation to raw tobacco, tobacco leaves, waste, etc. (Ramboll, 2014).

These studies lead to the conclusion reached by A. Smith, that the most effective design of an excise policy necessarily implies the application of a single rate. However, Cnossen (2006) is of the opinion that regarding the design of the excise policy one should take into account the cost aspect of the substitute production. Although cigarettes are the most important tobacco product on the market, there are also other products, such as cigars and cigarillos that are consumed by short-listed consumers. Finally, fine cut tobacco, chewing tobacco, snuff or pipe tobacco are used for smoking. Different types of smoking tobacco are used for the personal production (rolling) of cigarettes. Basically it is lower quality processed products that are sold at lower prices, and it is logical that they should be subject to lower tax rates. Cnossen (2006) believes that it is realistic for the excise duty on 1 kilo of fine cut tobacco to amount to two thirds of the excise duty on cigarettes, expressed per 1 kilo of tobacco contained in cigarettes. Differences in taxation are necessary to reflect differences in the quality and costs between industrial production of cigarettes and tobacco wrapping.

2.3 ON POLICY CONVERGENCE IN THE EUROPEAN UNION

Choosing between the *ad valorem* and the specific excise rate or the application of an excise mix, the effect of income and substitution, elasticity of consumption and cross elasticity are important elements for the design of national policies in excise duties on tobacco in each country. However, in a complex community such as the European Union (EU) the coordination and harmonization of policies at EU level are required. Autonomous national excise policies can produce negative effects of harmful tax competition between member states and on the functioning of the single market. The process of positive harmonization of excise duties on tobacco at EU level, which was started by opening the market EC 1992, quickly gained a new dimension in the convergence process of excise policies of member states. The process should contribute to the achievement of the objectives of the health policy of member states and the EU (EU, 2007) since a certain number of EU

member states, to wit Austria, Bulgaria, Estonia, Finland, France, Greece, Poland, Romania and the United Kingdom, have linked excise and health policy by earmarking revenues from tobacco tax for the financing of public health activities (Rechel and McKee, 2014). Cnossen (2006) explored the impact of the large differences in excise burden and cigarette prices across the Union in the condition of free interstate trade and found a massive amount of smuggling across the external Union borders and bootlegging inside the Union due to tax competition among the member states. He concluded that harmonization of tobacco taxation could mitigate the bootlegging problems. Empirical studies of the convergence effects of excises in the period 2002-2012 showed a faster reduction in the difference between the excise burden and retail prices of the old member states (Cooper and Witt, 2012). At the same time, due to the faster pace of harmonization and lower incomes, new member states are more vulnerable to the growth of the black market and tax evasion. As a positive effect of the EU excise policy Cnossen (2006) states the shifting of the taxation focus from the *ad valorem* to the specific excise duty. Advocating a longer transition period of adjustments for new member states, Cnossen believes that a further increase in the excise duty (over EUR 60) would be counterproductive. Crawford, Keen and Smith (IFS, 2010) had a similar position. Taking into account the heterogeneity of the Union they believe that the imposition of higher excise uniformity at EU level would produce economic inefficiencies and the erosion of revenues. However, according to Yurekli (2013), such inefficiency is to some extent to be expected given that the policy of excise duties on tobacco in the EU represents a political compromise, by which excise policies existing in the EU member states are "blessed". On the other hand, empirical research on the effects of the single market on the EU excise policy in the period 1987-2004 has shown that the creation of a single market and, consequently, the introduction of minimum standards of taxation at EU level, represented a significant milestone for reforms in the excise policies of member states (Lockwood and Migali, 2008). All this indicates that the process of convergence of excise duties on tobacco is bi-directional and that its efficient performance involves constant mutual adjustments of the excise policy of the EU and the excise policies of member states.

3 TRENDS IN CIGARETTE TAXATION POLICY

3.1 LEGAL FRAMEWORK

Tobacco products in the EU, which are subject to harmonization of excise duties, include cigarettes, cigars and cigarillos, as well as smoking tobacco. Smoking tobacco includes fine cut tobacco and other smoking tobacco. According to Council Directive 92/79/EEC on the approximation of taxes on cigarettes the member states are obliged to levy a proportional (*ad valorem*) excise duty, which is determined as a percentage of the retail cigarette price, and a specific excise duty, determined for 1,000 pieces of cigarettes.

For many years, the basic characteristics in the area of tobacco taxation in the EU was the polarization between member states that have developed a domestic tobacco industry and member states which are predominantly importers of tobacco products. Member states with their own tobacco industry, as a rule, have higher rates of *ad valorem* excise duties on cigarettes in order to protect domestic brands, which are usually exposed to international competition. Because of the diversity of national excise policies, which were enhanced with the process of the EU enlargement, the realization of the convergence of member states' excise policies in the direction of creating a coherent EU excise policy required the introduction of a minimum excise duty. Minimum standards for the taxation of tobacco products are prescribed for each specified group. The minimum excise duty on cigarettes in the EU applied from the very beginning of the establishment of a harmonized system of excise taxes in 1993, when, based on Council Directive 92/79/EEC, it was set in the amount of 57% of the retail selling price of the most popular price category of cigarettes ("criterion 57%"). In line with Council Directive 95/59/EC on taxes other than turnover taxes which affect the consumption of manufactured tobacco the specific element had to represent between 5% and 55% of the total tax burden (total excise duty plus VAT) of the most popular price category of cigarettes.

According to the amendments of the Directive from 1 of July 2002 each member state is obliged to apply an overall minimum excise duty, comprising specific excise and *ad valorem* excise excluding VAT, at the level of 57% of the retail selling price (inclusive of all taxes). In addition, it should not be less than EUR 60/1,000 cigarettes for cigarettes of the price category most in demand. Those member states which levy an overall minimum excise duty of at least EUR 95/1,000 pieces of cigarettes for cigarettes of the price category most in demand need not comply with the 57% criterion. Pursuant to the dynamics prescribed by the Directive on 1 July 2006 the minimum total excise duty was increased to 64 EUR /1,000 pieces of cigarettes. Accordingly, the threshold for the non-application of the 57% criterion was increased to EUR 101/1,000 pieces of cigarettes.

According to Council Directive 2011/64/EU on the structure and rates of excise duty applied to manufactured tobacco as of 1 January 2014 an overall minimum excise duty was increased up to 90 EUR/1,000 pieces of cigarettes. The concept of "most popular price category" was replaced by weighted average price due to methodological drawbacks and large differences in its application within the EU. Accordingly, the relative threshold of 57% of the price of the most popular price category is replaced by the new one of 60% of the weighted average price of cigarettes ("the 60% criterion"). The lower limit for specific component was increased from 5% to 7.5% and the upper from 55% to 76.5% of the amount of the total tax burden (total excise duty plus VAT).

3.2 TRENDS IN POLICY

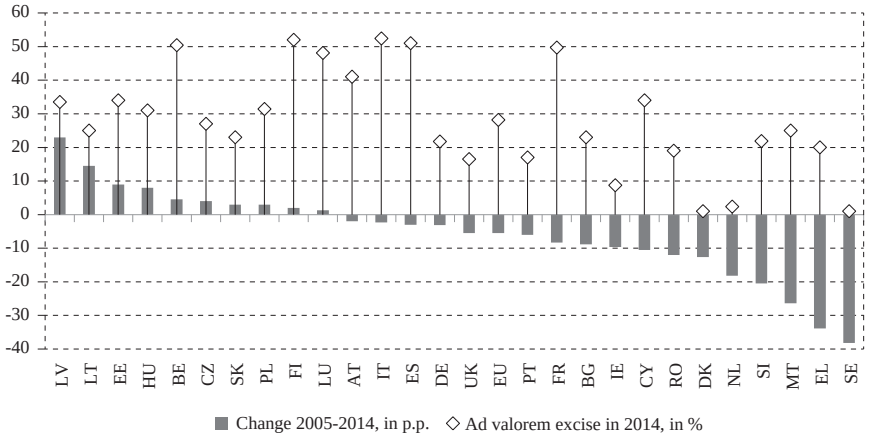
In determining the minimum amount of excise duty of 60 EUR the EU was aware that some member states would not be able within the prescribed period to increase rates of excise duty to the minimum necessary. A further increase in the minimum excise duty to 64 EUR and then to 90 EUR represents a major burden for the new EU member states. Similarly, the introduction of the 60% criterion for the weighted average price of cigarettes is a significant deterioration in the criteria for member states that have the large discrepancy between the price of the most popular brands (which are usually the cheapest) and the weighted average price. In developed member states the differences between these two reference prices are insignificant. Although the new minimum excise duty of EUR 90/1,000 cigarettes was prescribed in 2011, in six member states to which a transition period for harmonization was granted, excises are still below the prescribed minimum while in terms of the 60% criterion, eight member states are below the prescribed minimum.

A large number of member states have implemented the process of harmonization of the excise burden with the EU minimum standards by changing the structure of excise rates – reducing the rate of the *ad valorem* excise duty, although there are member states that have increased the *ad valorem* excise duty (chart 1). On the whole in ten years the average *ad valorem* excise duty in the EU-27 decreased by 8.2 p.p.

Unlike the *ad valorem* excise duty all member states have increased the specific excise duty (chart 2). At EU level the average specific excise duty has been increased by 140%.

Chart 1

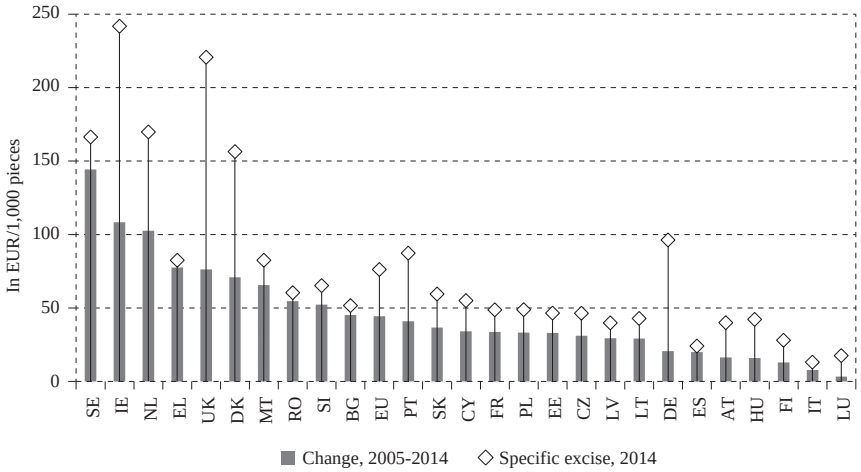
Changes in the ad valorem excise duty in the EU (2005-2014)



Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

CHART 2

Changes in the specific excise duty in the EU (2005-2014)

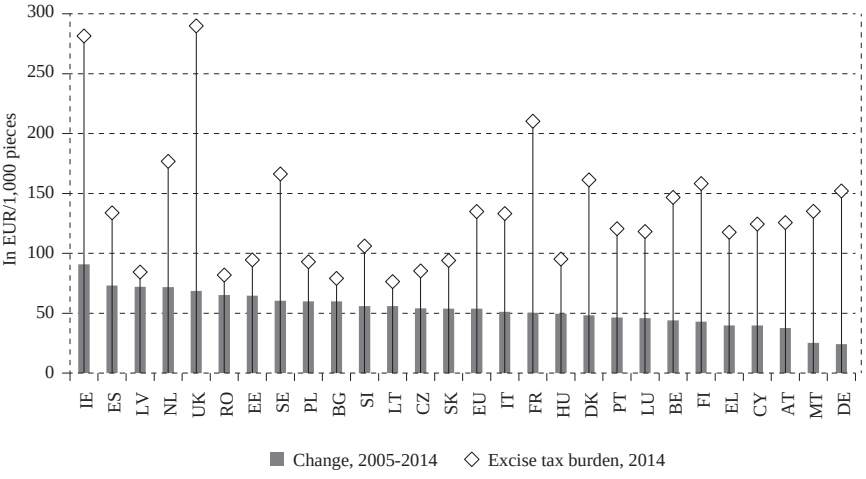


Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

All these changes have affected the size and structure of the tax burden on cigarettes. In the period 2005-2014 there was an increase in the excise burden in all member states, and the average excise burden on the price of cigarettes in the EU increased by 66%. It is necessary to bear in mind the different bases for comparison, given that until 2011 the excise burden was measured compared to the most popular price category while since 2012 it has been measure in comparison to the weighted average price of cigarettes. Thus, changes in the period 2005-2014 (chart 3) reflect differences in the excise burden between two referent prices.

CHART 3

Changes in the excise burden on cigarettes (2005-2014)

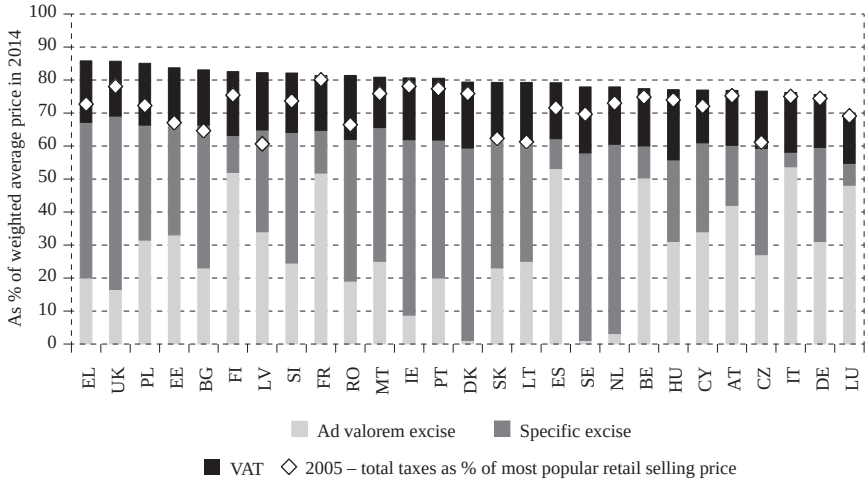


Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

Chart 4 shows the differences in the tax burden on the most popular price category of cigarettes and the weighted average price. In some new member states (Poland, Hungary, Latvia and Lithuania) the differences indicate that there are large price ranges between the cheapest (and at the same time most popular) cigarettes and more expensive brands.

CHART 4

Tax structure of cigarette prices in the EU-15 (2005-2014)



Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

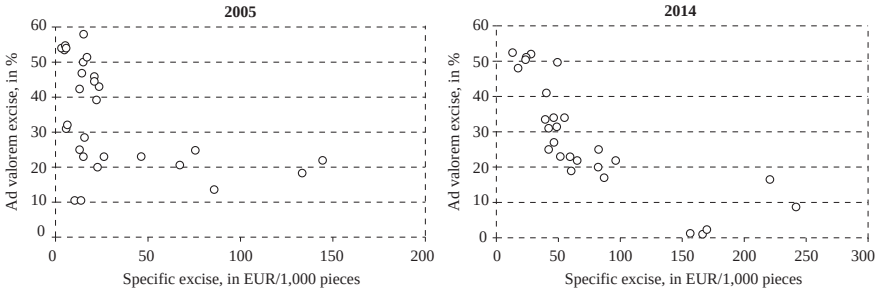
In the analysis of the excise and total tax burden on cigarettes it is necessary to bear in mind that the period of the analysis coincides with the time of the occurrence and effects of the global economic crisis. A large number of member states, with the aim of fiscal consolidation, increased the VAT rate, which had an effect not only on the amount of retail cigarette prices and the structure of the tax burden on cigarettes but also on the amount of the weighted average price.

4 CONVERGENCE PROCESS OF EXCISE DUTIES ON CIGARETTES IN THE EUROPEAN UNION

The process of changing the structure of excise duties has led to significant shifts at EU level in the past ten years. In terms of the *ad valorem* excise duty in 2014, the grouping of member states in the zone between 20% and 35% was notable, compared to 2005 when there was significant dispersion in a wide range of rates. The biggest changes occurred in the specific excise duty. In 2005 most of the member states had a specific excise duty of up to 25 EUR/1,000 pieces, while today most of them are within the range of 50 to 100 EUR/1,000 pieces (chart 5).

CHART 5

Evolution of the harmonization of excise duties on tobacco in the EU, 2005-2014

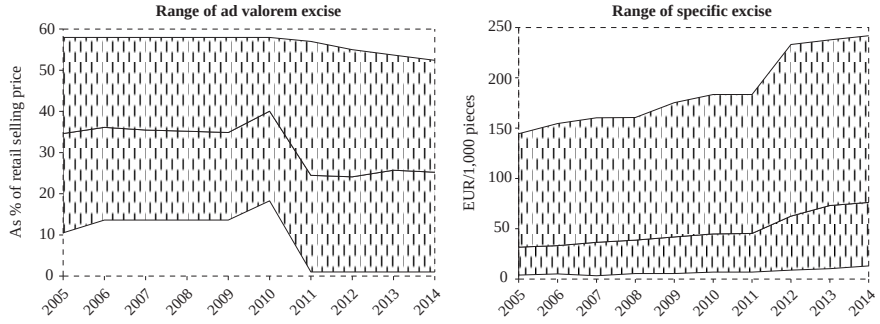


Source: European Commission – CIRCABC Database (1990-2014).

The range between the highest and lowest rate of the *ad valorem* excise duty increased after 2010 as a result of varying the adjustment of member states to the rate convergence policy. On the one hand, there was a slight reduction in the maximum rate, and on the other, there was a sharp fall in the lowest rate applied by member states. This is also the reason for the sudden increase of variation width and its retention at a high level (chart 6). There are two reasons for the increase in variation width between the minimum and maximum specific excise rate (table 2): (1) the slow adaptation of member states with high rates of the *ad valorem* excise duty, and (2) the rapid growth of the specific excise duty of member states which have traditionally had high rates of the specific excise duty and lower than average rates of the *ad valorem* excise duty (United Kingdom, Ireland, Germany, Denmark, Portugal,...).

CHART 6

Ranges of excise rates on cigarettes in the EU-27



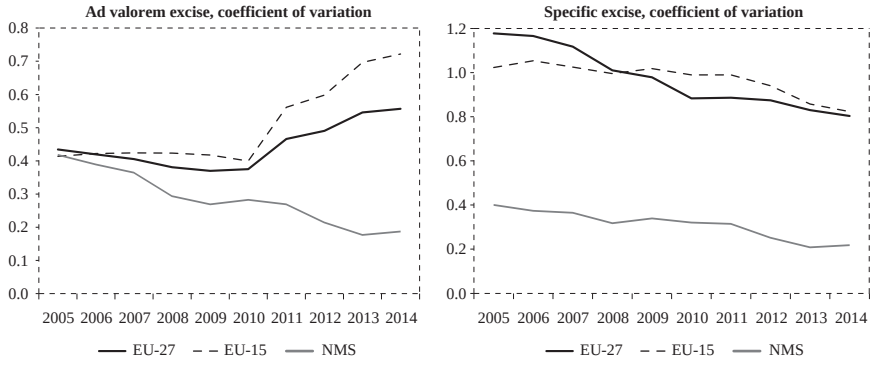
Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

As a result of uncoordinated changes in the excise policy of member states the average rate of the *ad valorem* excise duty at EU level within the period 2005-2010 increased by 2.3 p.p., but in the last four years it was reduced by 8 p.p. On the other hand, the process of the continuous increase in the specific excise duty

has resulted in strong growth in the average specific excise at EU level which increased from 27.8 EUR/1,000 pieces in 2005 to 63 EUR/1,000 pieces in 2014.

The divergent policies of the old member states ("EU-15") in terms of the *ad valorem* excise led to a deterioration of the variation coefficient, not only for this group but also for the whole of the EU (chart 7). On the other hand, rapid adjustment of the new member states (NMS) to the minimum standards of the EU has led to a reduction in the rate dispersion around the average for this group. In the case of the specific excise duty a constant reduction in dispersion is notable in old as well as in new member states, as a result of the policy of continuous increase in rates (chart 7).

CHART 7
Variability of excise rates on cigarettes in the EU-27



Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

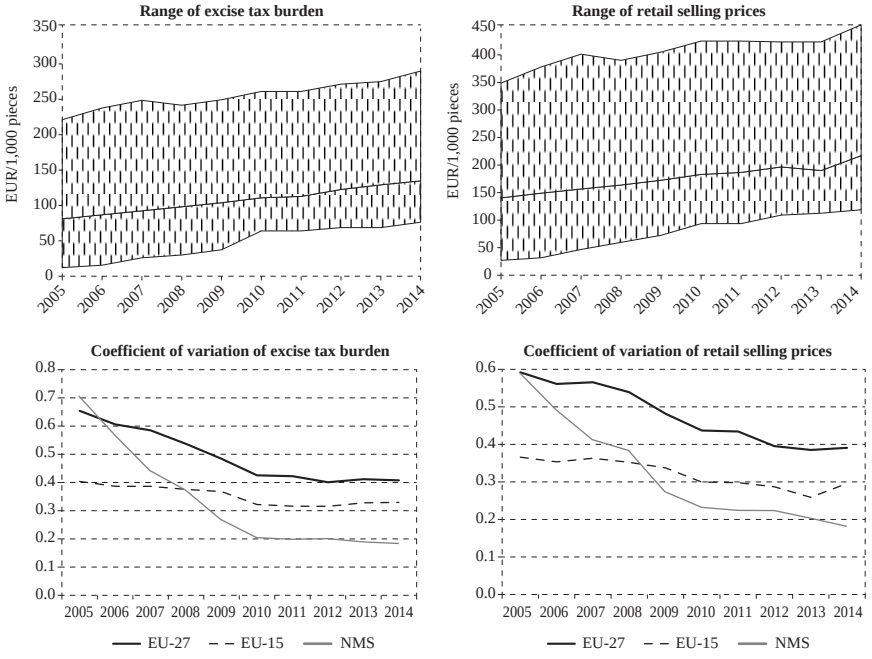
Increase in excise rates on cigarettes in member states led to a gradual increase in the excise burden on cigarette prices. The situation presented in chart 8 shows a trend for the excise burden to grow while keeping to the same ranges. Maximum values are related to the old member states and the minimum to the new ones.

While looking at the trends and drawing conclusions it is necessary to bear in mind that the series of data on the excise burdens and prices in member states are not entirely consistent. Due to standards that were in force, data on the excise burden on cigarette prices and amount in the period 2005-2011 related to the most popular price category and in the period 2012-2014 to the weighted average price. In any case, the trends show a rise in retail selling prices of cigarettes in the EU member states with the ranges between the most expensive and the cheapest cigarettes remaining the same. However, the downward variation coefficient in the excise burden and prices shows a reduction of variability in both the old and the new EU member states until 2011 and since 2012 the variation coefficient has grown in the old member states. This can be connected with the different bases for the application of the *ad valorem* excise duty (weighted average price in relation

to the most popular price category), but also with the strong growth in the specific excise duty in some member states (United Kingdom, France, Sweden,...) which led to the increase in prices.

CHART 8

Variability of prices and excise burden on cigarettes in the EU-27



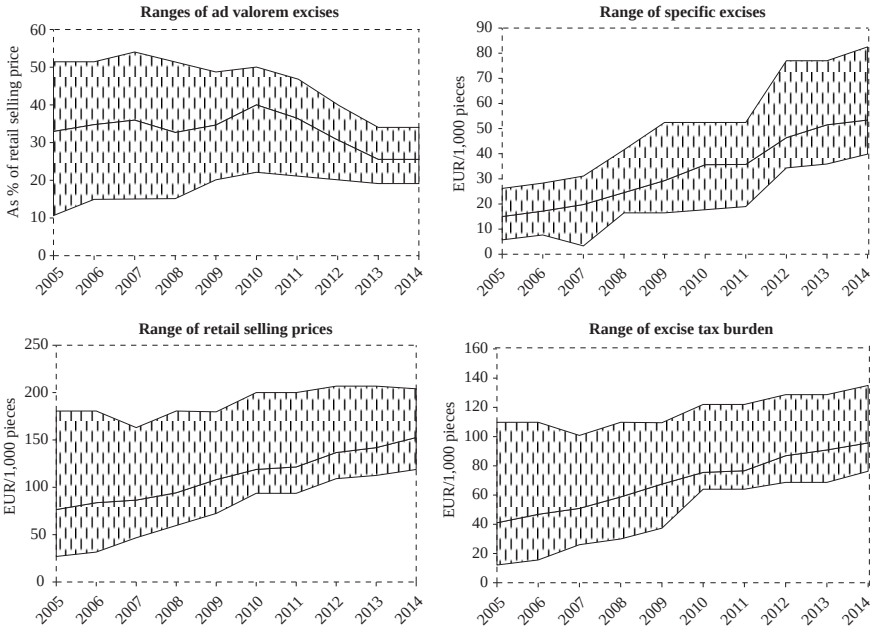
Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

Previous analyses showed a high homogeneity of excise policies of the new EU member states. There are two main reasons for this. First, all of the new member states were in a similar starting position before entering the EU. Second, the process of harmonization with the minimum excise duty of 64 EUR, i.e. 90 EUR, is being conducted by the new member states through a policy that implies a simultaneous decrease in the *ad valorem* excise duty and an increase in the specific excise duty. The indicator of the width of variation of excise rates is not relevant to the analysis because extreme values of both specific and *ad valorem* excise duty throughout the period are found in the old EU member states. From the above analysis it can be concluded that the old member states also have the highest excise burdens and cigarette prices. However, it cannot be concluded from this that the trends in the cigarette taxation in the new member states are not relevant to the convergence of the EU excise policy. Analysis of the range of rates indicates a significant reduction in rates and a narrowing of dispersal in the *ad valorem* excise duty (chart 9). In the specific excise duty steady growth is notable, with the range between the highest and the lowest rate being increased. These trends led to an increase in the excise burden so that the prescribed minimum of EUR 64/1,000 pieces

was achieved in 2010 and since then the process of harmonization with the new minimum of excise duty of EUR 90/1,000 pieces has been continued. The policy of continuous reduction in *ad valorem* rates and the increase in the specific excise duty has led to a constant rise in cigarette prices and a narrowing of price ranges.

CHART 9

Convergence process of excise duties on cigarettes in the new EU member states (2005-2014)



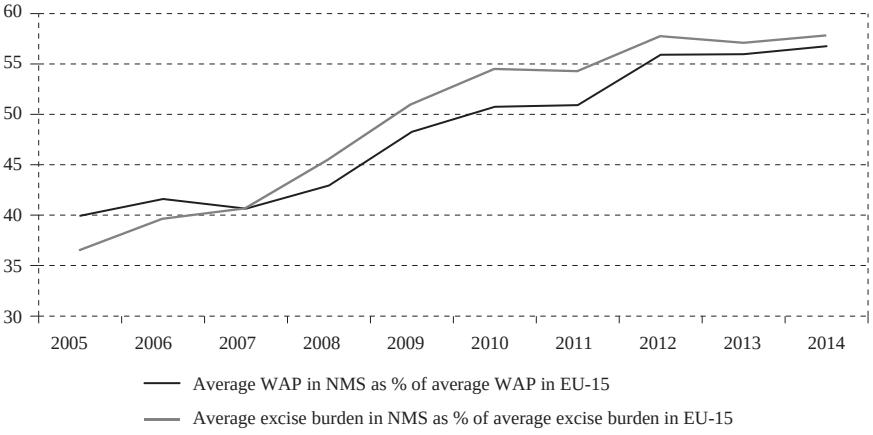
Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

Despite the strong polarization between the old and new member states a gradual convergence of these two groups is discernible. It is shown by the following indicators. First, the average excise burden on cigarettes in the new member states as a percentage of the average excise burden in the old member states in the period 2005-2014 increased from 36.3% to 57.6% (chart 3). Second, the convergence of cigarette prices is evident. The average price of cigarettes in the new member states in 2005 amounted 39.9% from the average price in the EU-15 and in 2014 this ratio was increased to 56.8% (chart 10).

Analysis of the coefficient of variation showed a deep division between the old and new member states which also affected the pace of convergence. However, it can be concluded that the EU by its policy on the excise duties on cigarettes in the past ten years, despite all the objective obstacles, managed to direct the national excise policies in the route of the convergence process.

CHART 10

Convergence process in NMS (in %)



[a] *It is the arithmetic average of the members group.*
[b] *In the period 2005-2011 the price of the most popular price category has been applied and in the period 2012-2014 the weighted average price of cigarettes.*

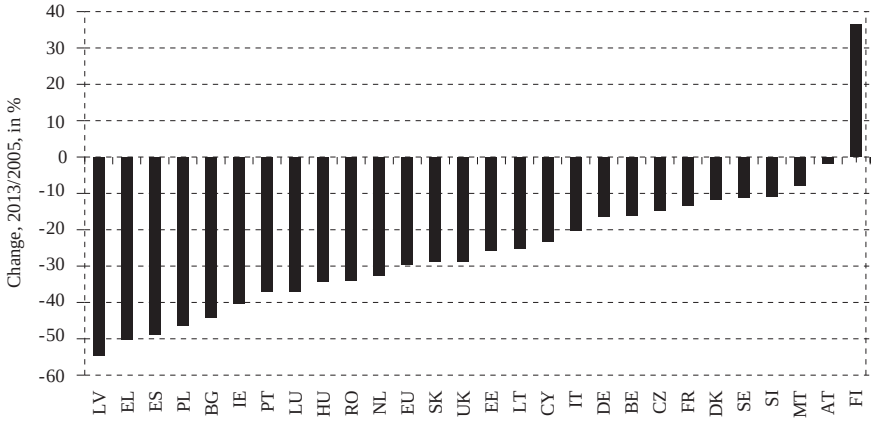
Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

5 TRENDS IN REVENUES FROM EXCISE DUTIES ON TOBACCO

Continuous increase in excise duties on cigarettes in most member states has, as expected, brought an increase in retail selling prices and, consequently, a strong reduction in cigarette consumption. Comparison of cigarette consumption in 2013 with that in 2005 shows that a decrease in consumption has been recorded in all member states, and in some of them the consumption has been halved. The increase in the consumption of cigarettes in 2013 in Finland is a result of the accumulation of amounts of cigarettes before the increase in excise duties in 2014 (chart 11).

CHART 11

Changes in consumption of cigarettes in the EU member states (2005-2013)



Consumption in Greece for 2013 relates to the period January – November.

Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

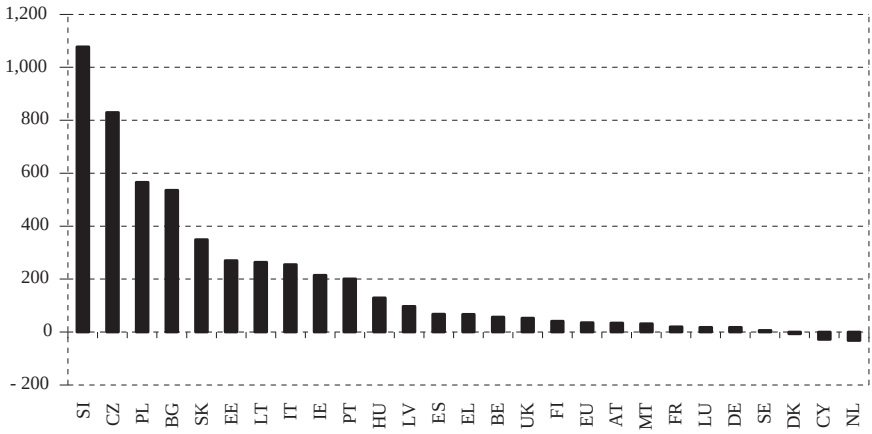
The increase in the excise burden on cigarettes was not the only reason for the decline in cigarette consumption in the EU member states. Another reason was the inconsistent policy of taxation of tobacco products in the EU, which favored fine cut tobacco. Raising the minimum excise duty on cigarettes in the EU to 90 EUR/1,000 pieces, which was not accompanied by an appropriate increase of the excise duty on fine cut tobacco, for consumers of most member states represented a trigger for mass migration from the cigarette to the fine cut tobacco market. Consumption of fine cut tobacco in some member states in just a few years has doubled while Romania and Slovenia recorded enormous growth (chart 12).

New trends have brought a new analytical approach in researches into the tobacco market. Until a few years ago, analyses of the tobacco market were limited only to cigarettes as the share of other tobacco products was minor. After the emergence of a strong substitution of fine cut tobacco for cigarettes it is necessary to consider total trends in all tobacco products. Otherwise, without considering the overall trends and observing only cigarette consumption could create the illusion that trends in tobacco consumption were in line with the health policy goals.

The growing excise burden on cigarettes in the EU up to a certain moment brought a growth in revenues from excise duties but then a strong decline in cigarette consumption offset the increase in excise duties and in some member states it brought revenues into a negative growth zone.

Chart 12

Changes in fine cut tobacco consumption in the period 2008-2013 (in %)

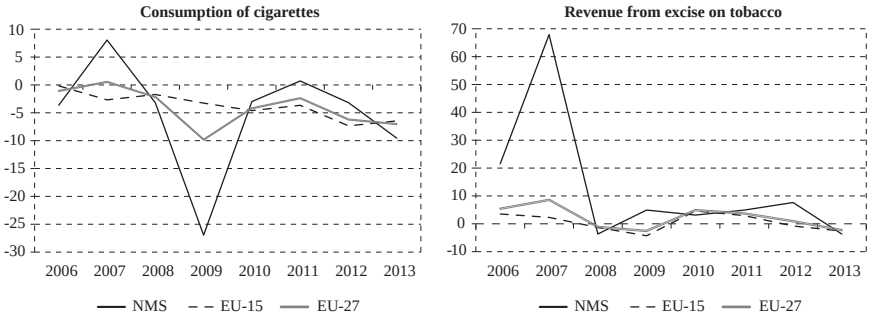


[a] *Consumption in Greece for 2013 relates to the period January – November.*
[b] *Romania has been omitted due to enormous growth over 2,000%.*

Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

CHART 13

Annual changes in consumption and revenues of tobacco in the EU (in %)



Source: European Commission – CIRCABC Database (1990-2014), except for revenues in Romania in 2013 which were obtained from the Ministry of Public Finance of Romania; author's calculation.

Overall, the consumption of cigarettes and revenue collection in the new member states have been subject to strong fluctuations due to harmonization with the minimum excise duty of EUR 64, and in the last two years due to the growing substitution of cigarettes by fine cut tobacco. As expected, the increase in excise duties in the new member states brought enormous revenue growth in the first few years, but after stabilization of revenues there was a slowdown of the growth. On the other hand, cigarette consumption in the EU-15 has been continuously declining, but with no major fluctuations, while revenues fluctuated in the range from -5% to 5% (chart 13).

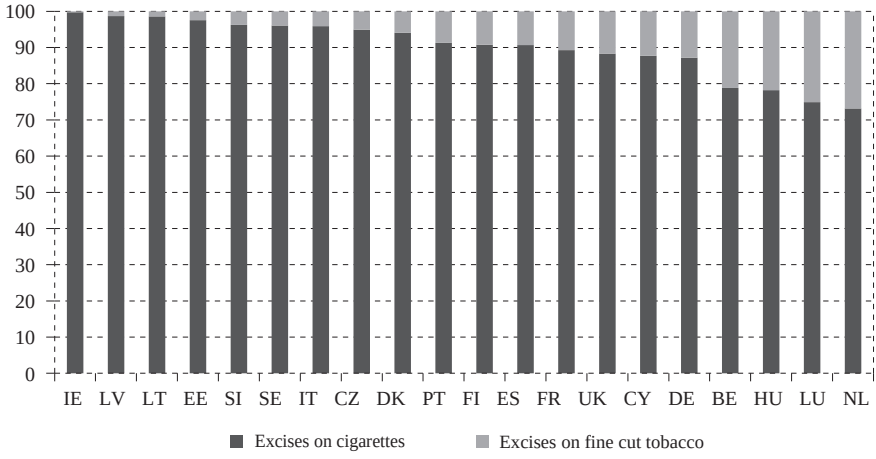
The extent of the erosion in cigarette consumption and revenues is best shown by a comparison with the base year 2005. Cigarette consumption in the EU-15 in 2013 was reduced to 70% of the consumption in 2005. Revenues from excise duties on cigarettes were in the same period increased by 4% with a downward trend, although the excise burden on cigarettes on average increased by 47%. Although, due to higher weights, the trends in the EU-15 mainly determine trends in the EU-27, it is interesting to analyze the trends in the new member states. Increase in the excise burden on cigarettes by an average of 133% during the nine-year harmonization process has brought a growth of excise revenues of 131%, whereas at the same time the consumption of cigarettes dropped to 63% of the consumption of 2005. The results of the above analysis are confirmed by trends in member states in the period 2011-2013 when the effects of cigarette substitutions are mostly shown. Of 27 member states, ten of them which have 37% of revenues, in the last three years showed negative trends in the collection of revenues from excise duties on cigarettes. Of these ten members, nine of which belong to the EU-15, four in all three years recorded a drop in revenues with the declining tendency, and others recorded a decline in revenues in the last two years. On the other hand, five new member states recorded strong revenue growth; five recorded stable or moderate growth, while Romania recorded zero growth. Bearing in mind that excise duties

are much higher in old member states than in new member states the existing trends indicate the negative sides of a rapid growth in excise duties, which on the one hand was not accompanied by adequate measures to prevent tax evasion and frauds, and on the other hand by adequate tax policy with respect to cigarette substitutes.

Reduction in cigarette consumption and the increase in fine cut tobacco consumption, in addition to fiscal losses, led to changes in the structure of excise revenues (chart 14).

Chart 14

Structure of revenues from excise duties in the EU, 2013 (in %)



Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

The share of revenues from excise duties on fine cut tobacco is growing rapidly from its previously insignificant level. This trend is the result of the cumulative effect of the nominal decrease in revenues from excise duties on cigarettes and nominal growth in excise duties on fine cut tobacco, which is the result of inconsistent excise policy on fine cut tobacco in the EU.

6 REDEFININING THE TAXATION POLICY OF OTHER TOBACCO PRODUCTS IN THE EUROPEAN UNION

Analysis of the policies and trends in consumption and revenues indicated large distortions in the market for cigarettes, which are the result of the differentiated taxation of substitutes and poor mechanisms for the prevention of tax evasion. In addition to undermining revenue collection the substitution of fine cut tobacco for cigarettes seriously jeopardizes the realization of the health policy objectives. Instead of being an instrument to discourage tobacco consumption, the excise policy has not only enabled consumers with lower incomes to maintain the same volume of tobacco consumption, but it has also encouraged them to buy cheaper and low quality tobacco. The unsustainability of the current situation suggests the need for

urgent redefinition of the excise policy on fine cut tobacco and other cigarette substitutes. The harmonization of excise duties on cigarette substitutes should stop further growth of legal and illegal substitution for the consumption of cigarettes and in the long term stabilize the cigarette market, in order to continue with the application of measures to discourage tobacco consumption.

For many years the taxation of other tobacco products (cigars, cigarillos, fine cut tobacco, other smoking tobacco) was considered a residual segment of the taxation policy of tobacco due to the minor share of these products in revenues and tobacco market. According to EU directives other tobacco products can be subject to only *ad valorem* excise or to only specific excise or a combination of *ad valorem* and specific excise. When the single market was being established, the taxation of fine cut tobacco in the amount of 30% of the retail selling price including taxes or EUR 20/kg was stipulated. Rates of excise duties on fine cut tobacco were not changed until 2001. In the period 2001-2004 the rate was increased from EUR 24/kg to EUR 32/kg. The next increase was recorded in 2011 (EUR 40/kg), and then in 2013 (EUR 47/kg). Other smoking tobacco is currently taxed with EUR 22/kg or 20% of the retail selling price.

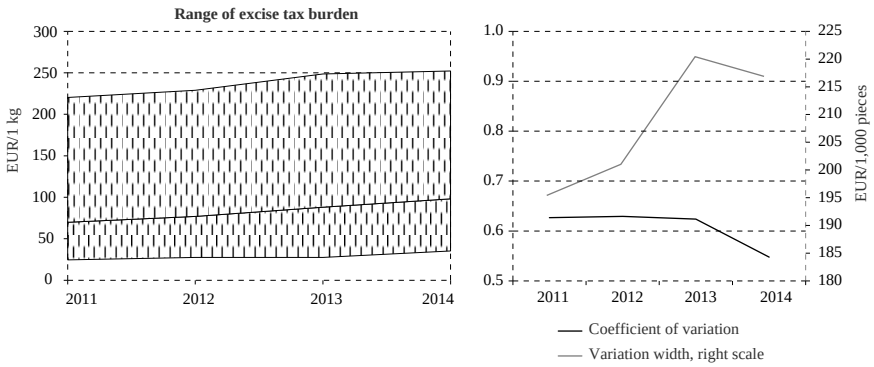
Analysis of the fine cut tobacco taxation policy in the previous years indicates a significant increase in the excise burden on fine cut tobacco in EU member states. Basically, the increase in the excise burden has been achieved by (1) increasing the existing specific excise duty, (2) introduction of the specific excise duty and a drastic reduction of the *ad valorem* excise duty, or (3) in member states with a mixture of excise duties by the increase in the specific excise and reduction of the *ad valorem* excise.

In 2011 in six member states fine cut tobacco was subject to only *ad valorem* excise and in 2014 in only three, two of which have in the meantime increased the rate, while Hungary kept the same rate of the *ad valorem* excise duty, with the proviso that the effect of the increase in the excise burden was achieved by increasing the VAT rate. The number of member states that have only the specific excise duty was in the period 2011-2014 doubled, from 7 to 15 (including Croatia), and the number of member states that have a mixture of the *ad valorem* and the specific excise duty was reduced from 14 to 10. Contrary to trends in the EU, Slovenia insignificantly increased the specific excise duty but as of 1 July 2014 it has had the *ad valorem* as well, which ultimately led to strong growth in the excise burden.

On the whole, the policy of increasing excise duties on fine cut tobacco in the last four years has led to the growth of the average excise burden on fine cut tobacco in the EU by 40% (chart 15). In the period 2010-2013 inconsistent policies of member states led to a growth in the width of variation. Only the last measures for the consolidation of the excise policy in 2014 resulted in a greater convergence of excise rates that were reflected in the decrease of variation coefficient and variation width narrowing.

CHART 15

Variability of the excise burden on fine cut tobacco in the EU-27 (2011-2014)

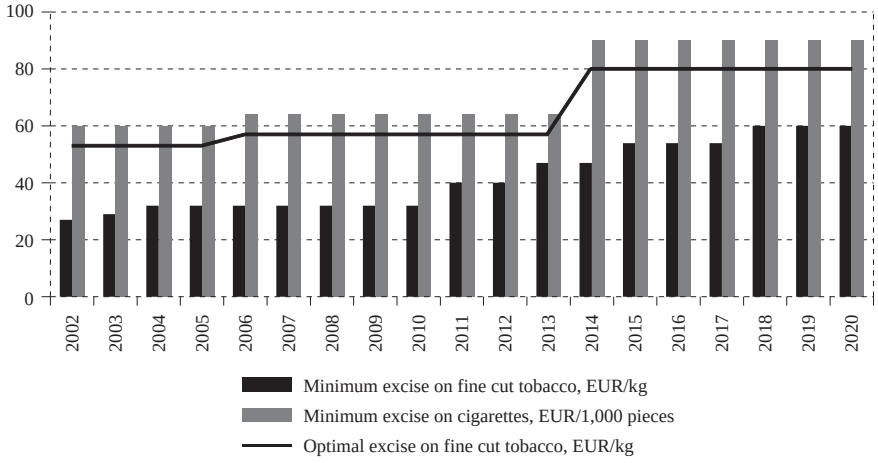


Source: European Commission – CIRCABC Database (1990-2014); author's calculation.

Although the policy of minimum excise duty on fine cut tobacco in the past few years has been based on strong growth in excise duties, parallel increase in the minimum excise duty on cigarettes to a certain extent from the start derogates from the expected success of this policy. Even the planned increase in excise rates on fine cut tobacco by 2020 will not significantly reach the level of Cnossen's optimal excise burden on fine cut tobacco of two thirds of the excise burden on cigarettes, measured according to 1 kg of tobacco contained in cigarettes (chart 16).

CHART 16

The minimum excise duty on cigarettes and fine cut tobacco in the EU by 2020 (in EUR)



Source: Author's calculation.

It can be expected that a strong tax pressure on fine cut tobacco consumption in the following years will discourage the consumption of this product. However, given the experience of Poland and some other countries outside the EU it is necessary to consider the taxation of other substitutes such as pipe tobacco and other types of smoking tobacco. At the moment there is a huge gap between the taxation of fine cut tobacco and other tobacco, which will be in the following years even higher due to further increase in excise duties on fine cut tobacco. In addition, economists warn of a need for a more precise definition of tobacco products, which entails the proper positioning of excise rates, particularly for raw tobacco. Finally, the rapidly growing market for e-cigarettes is a serious warning to the EU and member states that in the coming years a stronger substitution of e-cigarettes for cigarettes can be expected. Currently, only in two member states, Belgium and Luxembourg, e-cigarettes are taxed if they contain tobacco extract (Ramboll, 2014).

7 CONCLUSION

A strong increase in the minimum excise duty at EU level has seemed to be of crucial importance for the process of convergence of excise policies at EU level. From the analysis of the EU taxation trends in the period 2008-2014 it can be concluded that a process of convergence of excise policies within the EU is being achieved by simultaneous implementation of two processes: continuous increase of the excise burden on cigarettes and continuous changes in the structure of the excise burden in favor of the specific excise. Both processes lead to the rapid convergence of the excise burdens on cigarettes and the elimination of cheaper brands manufactured from poor quality tobacco. Ultimately, discouraging the consumption of poor quality and cheaper tobacco by high excise duties is in line with the objectives of the EU health policy. Excise policies of new member states are, due to circumstances that preceded their accession, more homogenous with respect to the old member states. Analysis of variation width showed that the pace of the convergence process of the excise policy *de facto* depended on the pace of adjustment of old member states which have in the past had very high rates of the *ad valorem* excise duty. Adjusting the taxation practices of these states implies the need to compensate for a gradual reduction of the *ad valorem* excise duty by a gradual increase in the specific excise duty.

Analysis of trends in tobacco taxation in the EU confirmed the hypothesis of the importance of cross-elasticity of substitute or complementary goods for the creation of an excise policy. Excise policy in the EU for many years was based only on a unilateral increase of excise duties on cigarettes in order to discourage consumption. However, data showing a significant reduction in cigarette consumption are an illusion because of the growing trends of fine cut tobacco consumption. The high degree of the substitution of fine cut tobacco for cigarettes has led to major disruptions in the tobacco market and a growth of the black market, so that a significant portion of tobacco consumption remains entirely untaxed or at best taxed at significantly lower excise rates. Data on the erosion of revenues in the last

two years show that the substitution was not revenue neutral and that further increase in fine cut tobacco consumption at the expense of cigarette consumption would affect the financing of the budget of member states and the health policy of those members with that earmark tobacco revenues for the health sector. Since the fine cut tobacco in the market is mainly of a lower quality than that used for cigarette production, the continuation of trends in the tobacco market would seriously undermine current achievements of the aims of the strategy to reduce smoking, especially among socially vulnerable groups and the younger population, which are more prone to substitution. The fact that in addition to smoking one may use other types of tobacco for smoking as well as e-cigarettes, which are taxed less than fine cut tobacco, requires a qualitatively new approach to the creation of the EU excise policy.

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The shadow economy: a relevant factor for investment decisions in selected European Union countries

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Article**
JEL: E26, E44, G15, G24
doi: 10.3326/fintp.39.3.3

* The author would like to thank thank two anonymous referees for their valuable comments.
** Received: June 4, 2015
Accepted: June 19, 2015

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FINANCIAL THEORY AND PRACTICE
39 (3) 305-323 (2015)

Abstract

The estimation of sovereign risk indicators has a key role for the investment decisions. We were witnesses of inaccurate ratings before the last economic crisis, which altered significantly the results expected by many investors. Thus, we propose an improved rating estimation justifying the insertion of new variables, specifically, the shadow economy as a percentage of the GDP. We find that by taking it into account, the credit rating estimation improves. Our estimation assigns a higher sovereign risk to the new European Union member states, whereas the old European Union member states see their sovereign risk decreased.

Keywords: shadow economy, sovereign risk, credit ratings, European Union, member states

1 INTRODUCTION

Few are those economists or politicians who could have imagined in advance the macroeconomic changes that have been taking place since the beginning of the last global economic crisis. In the early 2000s it was unthinkable that some European Union (EU) countries would come close to the economic, social and political collapse they have recently been experiencing. The public debt of many of them increased and their financing became more and more costly at the same time that their credit ratings got worse. In such an uncertain economic environment, taking investment decisions becomes a particularly complex task. Currently, there are still some EU countries that make strenuous efforts to get out of the crisis.

Some EU countries have also large informal sectors, which suggests that the size of the shadow economy may be a relevant factor in explaining the delayed exit from the crisis.[1] Recent data (Schneider, 2013) show that the shadow economy in Europe has increased in absolute value, although as a percentage of the GDP it decreased slightly in the past few years.[2]

Authors like Roca, Moreno and Sánchez (2001), and Elgin (2012) find that the shadow economy is countercyclical. Furthermore, Ferreira (2008) proves that the bigger the size of the shadow economy in a country, the higher the tendency to experience greater volatility in economic activity cycles.

Unemployment, which has increased in most countries since 2008-2009, is another relevant factor that is directly related to shadow economy evolution (Dobre and Alexandru, 2009).

[1] Shadow economy refers to the economic sector that evades administrative control and inclusion in the official statistics. It is also known as the underground economy, black economy, informal economy, etc. According to the International Labour Organization, there are around 15 different terms. Its main aim is to avoid taxes and social insurance charges.

[2] EU-27, Norway, Switzerland and Turkey.

Elgin and Uras (2012) associate a larger shadow economy with a bigger public debt, a higher interest rate charged on public debt, a greater financial instability and, in consequence, a higher probability of sovereign default. In 2008 there were just two EU countries whose public debt was close to 100% of GDP: Italy and Belgium. In 2012, there were ten with debts close to or above 100% of GDP.[3] Public debt has increased in all EU countries since the beginning of the crisis.

Considering that indicators like public deficit, public debt, and debt interests are essential for credit rating, in countries with large shadow economies, a tax rise can increase the size of the underground economy and reduce the government surplus that the tax rise was supposed to generate. A decrease in government spending could reduce the formal production, leading to a decrease in the size of the fiscal revenues, limiting again the government surplus generated by the reduction in government purchases. Thus, a tax rise or a decrease of government purchasing would increase the debt, and according to Elgin and Uras (2012), in the presence of a shadow economy, the probability of sovereign debt restructuring as well as the sovereign debt interest will tend to increase. Obviously, substantial reductions of the shadow economy could lead to a significant increase in tax revenues (Schneider and Enste, 2000), which would help to reduce the state's public deficit.

Despite the evident relationship between a country's performance and its underground economy, to the best of our knowledge, the latter has not been considered by the credit rating agencies in their assessments. Credit rating agencies provide information, to big companies or governments, regarding the likelihood that a country will repay its loans; therefore, they become particularly relevant in times of economic uncertainty.[4] These ratings should help investors identify their optimal investment decisions.

We propose to find ways to improve the credit ratings estimation by involving new factors. In particular, we will verify whether the shadow economy alters the sovereign risk estimation; the literature suggests that a sizable shadow economy could have a negative effect on economic stability and economic recovery. Moreover, while a large part of the existing literature adds more and more details on the causes of the shadow economy, and quantifies it (Schneider, 1998; 2002; 2007; Schneider and Enste, 2000; Schneider and Klinglmair, 2004), there is still a shortage of studies on its consequences. This paper aims to shed some light on this dimension. The discussion on the causes of the shadow economy mainly emphasizes the tax burden, culture, as well as the labour market regulation and the quality of institutions (Ferreira, 2008; Schneider, 2010), suggesting that overregulation and labour costs in the official economy impel the irregular economy.

[3] Belgium, Ireland, Italy, Greece, Spain, France, Hungary, Austria, Portugal, UK.
[4] A regulation of the credit rating agencies in the EU came into force in 2009 as the agencies play a key role in the financial markets and their ratings are taken into consideration by investors, borrowers, institutions and governments when they make their financial decisions.

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The old EU member states have, in general, high credit ratings and small shadow economies as a percentage of the GDP.[5] However, the new member states have lower credit ratings and larger shadow economies.[6] We find that countries with low sovereign risk improve their credit rating when we include in the estimate the shadow economy as a percentage of the GDP. On the contrary, countries with higher sovereign risk see a negative alteration of their ratings when it is taken into account that they have, in general, a relatively large unofficial economy. This improved credit rating estimation should help investors to take more accurate decisions.

We organize the paper as follows. The next section refers to methodology, section 3 includes the variables and data used, in section 4 we present the results and the last section includes the conclusions.

2 METHODOLOGY

The factor analysis that we apply to our data, described in this section, is a technique that permits reduction of the data dimensions. What we are seeking with it, is to find a minimal number of dimensions able to explain maximally the data information.

Factor analysis is appropriate when there is a good correlation between the variables, and they are explained by common factors. The purpose of factor analysis is to identify and quantify such factors.

It consists of the following phases:

– A matrix calculation able to express the joint variability of all variables: we test the degree of correlation through the Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity.
– Extraction of an optimal number of factors. We use a principal component analysis technique as it permits a joint treatment of the observed variables, reducing the number of data, and identifies a group of fictitious variables drawn from the combination of the observed. This way we can reduce the data and interrelate these data without introducing an initial hypothesis as to what each initial factor means. The principal components or factors are obtained after a computing process of characteristic roots and vectors of a symmetric matrix and aim to contain the most variance explained while avoiding redundant information. The factors have to be uncorrelated with each other and have to be expressed as a linear combination of the variables that have been observed. The more variance incorporated in each one of the components or factors, the greater quantity of information it contains.

[5] The old EU member states are Denmark, Finland, Germany, Netherlands, Sweden, United Kingdom, Austria, France, Belgium, Ireland.
[6] The new EU member states are Estonia, Slovak Republic, Slovenia, Bulgaria, Latvia, Lithuania, Croatia, Romania, Hungary, Poland.

– Rotation of the solution in order to facilitate the interpretation. The interpretation of the factor analysis results is based on the correlations of the variables and on the factors. The factorial loads of a factor with the variables have to be between 0 and 1, so variables with loads close to 1 are explained largely by the factor. Then, a variable has to have high factorial load just with one factor. Thus, if it is not possible to find a good interpretation of the factors with the initial solution, the factors can be rotated and so each variable could have a correlation close to 1 with one factor and close to 0 with the others.
– Estimation of the factors' scores. Once we have the final factors' solution, we find the score estimation of the subjects in each one of the resulting factors' extraction. The obtained value summarizes the information contained in the original variables.

Thus, we proceed with the factor analysis in order to detect the structure in the relationships between variables. In this context, each variable can be expressed as a linear combination of indirectly observed factors.

$$X_{ij} = a_{i1} F_{1j} + a_{i2} F_{2j} + a_{i3} F_{3j} + \ldots + d_i U_{ij}$$

where:

X_{ij} is the normalized value of the variable i for the country j,
a_{i1} is the relationship between variable i and Factor 1,
a_{i2} is the relationship between variable i and Factor 2,
F_{1j} is the value of Factor 1 for the country j,
F_{2j} is the value of Factor 2 for the country j,
$d_i U_{ij}$ is a uniqueness that is independent of the previously described factors,
d_i is the uniqueness of the variable i, and
U_{ij} is the way that this uniqueness affects the country j.

Next, we carry out a variance analysis which permits testing of the null hypothesis about equal means versus the alternative hypothesis that at least one of the groups is different from the others regarding its expected value. This contrast is essential when the interest is to compare the factor with respect to the dependent variable, which in our case is the country type (see results section). ANOVA requires the following assumptions to be satisfied: normality of the dependent variable corresponding to each factor probability distribution, the samples should be independent, and all statistical populations are required to have the same variance.

ANOVA is based on the data's total variance decomposition with respect to the aggregated mean which under the assumption that the null hypothesis is true, is an estimation of the q^2 using the whole sample information in two parts:

– Variation within groups.
– Variation between groups.

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3 DATA

The credit rating agencies use a large number of variables for their estimations. Some of the most relevant are used in our analysis jointly with an additional one, the shadow economy, in order to test whether the estimation improves or not. The variables finally selected in the analysis are the following:

GDP Per Capita measures the standard of living. Even if the shadow economy does not represent a relevant share of the official economy, it reduces the GDP per capita.

Real Investment (% change): there has been a relevant decrease in investment since the beginning of the crisis. We could not find a link in the literature between real investments and the shadow economy.

Unemployment Rate (% of workforce) is a variable that has experienced an increase in the last few years in many countries. Government expenditures on social programs also increased requiring additional tax revenues and producing a consequent increase of the public debt.

According to Alexandru, Dobre and Ghinararu (2011) and Dobre and Alexandru (2009), there is a direct relationship between the shadow economy and the unemployment.

General Government Gross Debt (% GDP). This variable also experienced an important rise in most countries and its reduction is especially difficult when growth is slow. Elgin and Uras (2012) point out that a larger shadow economy is related to higher public debt.

Other selected variables are **Deficit/Surplus (% GDP)** and **Primary Balance (% GDP)**.

Fiscal Revenues (% GDP). They decrease during economic downturns as household incomes fall. In the presence of a large shadow economy, fiscal revenues decrease.

Fiscal Expenditures (% GDP). A variable which rises automatically during recessions, as payments of unemployment and welfare benefits increase.

Fiscal Interest Expenditures (% GDP). Nowadays, due to the difficult economic situation many countries have to borrow in order to finance their relevant debts. In some cases, the interest expenditures increased substantially. Elgin and Uras (2012) suggest that in countries that have a large shadow economy and consequently a significant amount of tax evasion, fiscal policy adjustments could be questionable and the probability of debt defaults will grow, so the interest rates charged on sovereign debt increase, too.

Shadow Economy (GDP). As mentioned above, a high percentage of shadow economy has a direct relationship with the debt size and an inverse relationship with the business cycle.

Data for the first nine variables proceed from Standard and Poor's' statistics and those for the shadow economy are Schneider's (2013) estimations using the MIMIC approach. The reason for selecting Schneider (2013) as a source is that he provides a full set of data corresponding to the countries included in this study. All data are from 2012.

Once variables are described, we review the methods of shadow economy estimation. We briefly discuss direct and indirect methods and pay also some attention to the Multiple Indicators Multiple Causes (MIMIC) approach.

3.1 SHADOW ECONOMY DATA AND ESTIMATION

In the next lines we take a quick glance at the different methods used in the literature, and justify the data set we have selected. There are different direct and indirect methods to quantify the unofficial economy; all of them have their limitations. MIMIC is another approach, which focuses on the shadow economy's causes, but also on its consequences.[7]

Direct methods have high costs and it is necessary to assume certain sub-estimations. They are based on contacts with or observations of persons and/or firms, to gather direct information about undeclared income. Partially, they are based on the auditing of tax returns and on questionnaire surveys. Using direct surveys addressed to the economic agents is advantageous because they provide extensive information about tax evasion and about the shadow economy as a whole. The difficulties come with the selection of appropriate participants and their willingness to collaborate. According to Enste and Schneider (1998) direct methods are, in theory, reliable and simple, but in practice, less reliable and expensive.[8]

Indirect methods sometimes require not very realistic assumptions. The indirect methods measure the "traces" left by the underground economy in the official statistics. They are also called "indicator" approaches and use mainly macroeconomic data. These methods are used more often than the previous ones. They have a monetary or non-monetary character and may include different variables. Monetary methods, for instance, draw from the hypothesis that irregular transactions can be carried out using the most liquid form of money, especially cash and bank sight deposits. Indirect approaches contain information about the development of the shadow economy over time (Schneider and Klingmair, 2004). The size of the

[7] It is based on a dynamic multiple-indicators multiple-causes model, which includes a measurement model linking observable indicators to the size of the shadow economy and a structural equation model that links causes and consequences.

[8] It is possible that people who evade taxes do not want to respond honestly to surveys even though confidentiality is guaranteed.

shadow economy can be estimated through the discrepancy between national expenditure and income statistics, the discrepancy between the official and the actual labour force, the transactions approach, the currency demand approach, the electricity consumption method.

The multiple indicators multiple causes (MIMIC) approach or model approach is based on the statistical theory of latent variables. As Enste and Schneider (1998) explain, the underground economy is measured as an unobserved variable using a factor analytic approach. It consists, in general, of two parts: the measurement model, which associates the unobserved variable with observed indicators, and the structural equations model, which establishes the causal relationships among the unobserved variables. In order to proceed with the benchmarking and calculate the absolute values of the shadow economy, it is necessary to use other methods such as the currency demand approach.

The MIMIC approach has been used in the past 30 years by many authors, such as Helberger and Knepel (1988), Pozo (1996), Schneider (2003; 2007; 2013). However, it was strongly criticized by Breusch (2005), challenging the hypothesis of the MIMIC approach and indicating that some empirical results (Giles and Tedds, 2002; Dell'Anno and Schneider, 2003; Bajada and Schneider, 2005) he had analysed had no scientific value.

4 RESULTS

We begin by testing if it is suitable to conduct a factor analysis with the selected data used for the sovereign risk estimation.

Measuring the sampling adequacy, we find an acceptable result.

Table 1

Results of measuring the sampling adequacy

Kaiser-Meyer-Olkin measure of sampling adequacy		0.534
Bartlett's test of sphericity	Approx. Chi-square	276.235
	df	36
	Sig.	0.000

Source: Authors' findings.

Furthermore, we find that the null hypothesis can be rejected, and the adjustment of the variables through factor analysis is suitable. When we repeat the same tests, but including the variable shadow economy as a percentage of the GDP, we find that the sampling adequacy KMO improves as its value becomes 0.613 and the null hypothesis is again rejected.

Following the extraction of factors, we examine the table of Communalities which shows us how much of the variance in each of the original variables is explained by the extracted factors.

Table 2
Communalities

	Initial	Extraction
GDP Per Capita ($)	1.000	0.858
Real Investment (% change)	1.000	0.620
Unemployment Rate (% of workforce)	1.000	0.667
General Government Gross Debt (% GDP)	1.000	0.799
Deficit/Surplus (% GDP)	1.000	0.976
Primary Balance (% GDP)	1.000	0.974
Fiscal Revenues (% GDP)	1.000	0.917
Fiscal Expenditures (% GDP)	1.000	0.904
Fiscal Interest Expenditures (% GDP)	1.000	0.915

Extraction method: principal component analysis.

Source: Authors' findings.

The communality is the sum of the squares of factorial loads in each row. Principal components analysis assumes that the total variance of each of the original variables is explained by all components, and therefore, the communality takes the initial value of one.

In the second column we can see the respective communality for each variable after the extraction of the factors. The variance of a variable is decomposed in the variance which is due to the common factors and to the unique factors. We observe that variables such as Deficit/Surplus, Primary Balance, Fiscal Revenues, Fiscal Interest Expenditure and Fiscal Expenditures explain the variance to a greater degree.

Table 3
Communalities, with shadow economy (GDP)

	Initial	Extraction
GDP Per Capita ($)	1.000	0.895
Real Investment (% change)	1.000	0.612
Unemployment Rate (% of workforce)	1.000	0.672
General Government Gross Debt (% GDP)	1.000	0.820
Deficit/Surplus (% GDP)	1.000	0.968
Primary Balance (% GDP)	1.000	0.970
Fiscal Revenues (% GDP)	1.000	0.882
Fiscal Expenditures (% GDP)	1.000	0.852
Fiscal Interest Expenditures (% GDP)	1.000	0.913
Shadow Economy (% GDP)	1.000	0.832

Extraction method: principal component analysis.

Source: Authors' findings.

The previous tables with and without the variable "shadow economy as percentage of GDP" show that the communalities for all variables are above 0.50. Thus, we do not exclude any of them from the analysis on the basis of low communalities.

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To determine how many factors to include, we choose the variance explained by each one of the extracted factors. This information is presented in tables 4 and 5. The results (without the variable Shadow Economy (% GDP) indicate that after selection of the first factor (FAC 1.1), which includes the variables Per Capita GDP, Real Investment (change), Unemployment Rate (of workforce), General Government Gross Debt (GDP), Deficit/Surplus (GDP), Primary Balance (GDP), Fiscal Revenues (GDP), Fiscal Expenditures (GDP), Fiscal Interest Expenditures (GDP), explains 40.8% of the total sovereign risk variance.

Table 4

Total variance explained

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	3.676	40.845	40.845	3.676	40.845	40.845
2	2.691	29.901	70.745	2.691	29.901	70.745
3	1.264	14.046	84.791	1.264	14.046	84.791
4	0.556	6.179	90.970			
5	0.472	5.241	96.211			
6	0.267	2.967	99.178			
7	0.072	0.797	99.975			
8	0.002	0.024	99.999			
9	0.000	0.001	100.000			

Extraction method: principal component analysis.

Source: Authors' findings.

Once we include the shadow economy (% GDP), we obtain an improved sovereign risk estimation. The total variance explained by the first factor becomes now 44.4%.

Table 5

Total variance explained with the variable shadow economy (% GDP)

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	4.436	44.364	44.364	4.436	44.364	44.364
2	2.691	26.911	71.274	2.691	26.911	71.274
3	1.291	12.909	84.184	1.291	12.909	84.184
4	0.581	5.813	89.997			
5	0.528	5.283	95.280			
6	0.300	2.996	98.276			
7	0.099	0.993	99.269			
8	0.071	0.710	99.978			
9	0.002	0.021	99.999			

Extraction method: principal component analysis.

Source: Authors' findings.

We extract three components and obtain the matrix presented in table 6.

Table 6

Component matrix

	Component		
	1	**2**	**3**
GDP Per Capita ($)	0.859	0.201	-0.282
Real Investment (% change)	-0.596	0.394	-0.331
Unemployment Rate (% of workforce)	-0.580	-0.569	-0.082
General Government Gross Debt (% GDP)	0.724	-0.455	0.262
Deficit/Surplus (% GDP)	-0.314	0.888	0.297
Primary Balance (% GDP)	-0.050	0.611	0.773
Fiscal Revenues (% GDP)	0.775	0.534	-0.176
Fiscal Expenditures (% GDP)	0.867	0.296	-0.255
Fiscal Interest Expenditures (% GDP)	0.520	-0.600	0.534

Extraction method: principal component analysis.

Source: Authors' findings.

Table 6 shows the correlation coefficients of the original typified variables with the three retained principal components. GDP Per Capita, Fiscal Expenditures, Fiscal Revenues and Gross Debt have significant positive relationship with the first component. Once the variable Shadow Economy is included (see table 7), we can prove its strong negative relationship with the first component or factor. The variable GDP Per Capita is positively correlated to the first component in a higher degree. The variable Deficit/Surplus has again a significant positive relationship with the second component. Finally, Primary Balance has again a high positive correlation with the third component.

Table 7

Component matrix, with the variable shadow economy (GDP)

	Component		
	1	**2**	**3**
GDP Per Capita ($)	0.890	0.202	-0.251
Real Investment (% change)	-0.561	0.393	-0.378
Unemployment Rate (% of workforce)	-0.580	-0.570	-0.106
General Government Gross Debt (% GDP)	0.732	-0.454	0.280
Deficit/Surplus (% GDP)	-0.323	0.861	0.275
Primary Balance (% GDP)	-0.062	0.666	0.724
Fiscal Revenues (% GDP)	0.762	0.536	-0.120
Fiscal Expenditures (% GDP)	0.853	0.297	-0.189
Fiscal Interest Expenditures (% GDP)	0.484	-0.599	0.566
Shadow Economy (% GDP)	-0.898		0.159

Extraction method: principal component analysis.

Source: Authors' findings.

The next step in the analysis is the variance analysis of the first factor (FAC 1.1) and the variable *countrytype*[9] (see table 8a).

The means are different for each group. The critical probability value and the statistical Fisher-Snedecor value are shown in table 8b. The p-value is less than 0.05 and the null hypothesis of equal means is rejected, so there are differences in the means of each group and therefore sovereign risk is different for each group. The result for the new member states is negative which explains their higher risk rating and it is positive for the old member states, and this explains their lower risk rating.

TABLE 8

One way ANOVA I

a) REGR factor score 1 for analysis 1

	N	Mean	Std. deviation	Std. error	95% confidence interval for mean		Min.	Max.
					Lower bound	Upper bound		
New member states	10	-0.7919	0.4745	0.1500	-1.1312	-0.4524	-1.2676	0.2133
Old member states	10	0.7919	0.7018	0.2219	0.2898	1.2939	-0.5976	1.8981
Total	20	0.0000	1.0000	0.2236	-0.4680	0.4680	-1.2676	1.8981

b) REGR factor score 1 for analysis 1

	Sum of squares	df	Mean square	F	Sig.
Between groups	12.541	1	12.541	34.950	0.000
Within groups	6.459	18	0.359		
Total	19.000	19			

Source: Authors' findings.

The variance analysis with FAC 1.2 as dependent variable and *countrytype* indicates again that the means are different for each group, so the sovereign risk is different for each group. That is to say, the results are similar to those of ANOVA 1 (see table 8).

[9] At this stage we distinguish between old and new EU member states. The old member states take value 1 and the new member states, value 0.

TABLE 9
One way ANOVA II, with the variable shadow economy (GDP)

a) REGR factor score 1 for analysis 2

	N	Mean	Std. deviation	Std. error	95% confidence interval for mean		Min.	Max.
					Lower bound	Upper bound		
New member states	10	-0.8330	0.4204	0.1330	-1.1337	-0.5322	-1.3497	0.0201
Old member states	10	0.8330	0.6265	0.1981	0.3848	1.2811	-0.4433	1.7548
Total	20	0.0000	1.0000	0.2236	-0.4680	0.4680	-1.3497	1.7548

b) REGR factor score 1 for analysis 2

	Sum of squares	df	Mean square	F	Sig.
Between groups	13.877	1	13.877	48.754	0.000
Within groups	5.123	18	0.285		
Total	19.000	19			

Source: Authors' findings.

The comparison between the groups confirms our hypothesis. According to the results obtained in the first part of the analysis and using traditional variables, the mean value for the first group, new member states, was negative, which explains their lower credit rating (-0.792). However, the result was positive (0.792) for the group of old member states, which explains their low sovereign risk.

When the shadow economy as a percentage of GDP is considered, the results change. The means in this case are different from the previous means. There is a negative increase for the new member states, which suggests that their sovereign risk has been increased (-0.833), while in the group of the old member states, the result improves (0.833), which allows us to accept that their sovereign risk has been reduced.

As a previous step to the above justification, a linear association between FAC 1.1 and FAC 1.2 is made and a Pearson correlation coefficient is calculated. Following that is Spearsman's rho, which measures the association between FAC 1.1 and FAC 1.2 at ordinal level. We obtain that one explains the other with almost 99% of variance.

TABLE 10
Correlations

a)

		REGR factor score 1 for analysis 1	REGR factor score 1 for analysis 2
REGR factor score 1 for analysis 1	Pearson's Correlation	1	0.992**
	Sig. (2-tailed)		0.000
	N	20	20
REGR factor score 1 for analysis 2	Pearson's Correlation	0.992**	1
	Sig. (2-tailed)	0.000	
	N	20	20

Note: Correlation is significant at the 0.01 level (2-tailed).

b)

			REGR factor score 1 for analysis 1	REGR factor score 1 for analysis 2
Spearman's rho	REGR factor score 1 for analysis 1	Correlation coefficient	1.000	0.985**
		Sig. (2-tailed)		0.000
		N	20	20
	REGR factor score 1 for analysis 2	Correlation coefficient	0.985**	1.000
		Sig. (2-tailed)	0.000	
		N	20	20

Note: Correlation is significant at the 0.01 level (2-tailed).
Source: Authors' findings.

5 CONCLUSIONS

Investment decisions are becoming more and more complex, thus, in these circumstances, the availability of reliable information is essential. Although the role of credit rating agencies is to guide investors' decisions, credit ratings have not been sufficiently reliable indicators in the past years.

The literature documents a strong link between the shadow economy and a country's main economic variables. However, credit rating agencies have failed to take this relationship into account when assessing sovereign risk. The purpose of this paper was to analyze whether including the shadow economy into the estimation of the sovereign risk index of some selected old and new EU member states improves it or not. The results showed that the new EU members, that is, a country that is characterized by a relatively larger shadow economy and a lower GDP per capita than the old members, would acquire a worse credit rating. Conversely, the old EU member states would see their credit ratings improved.

ANNEX 1

S&P credit ratings (2012)

Country	Rating	Outlook
Denmark	AAA	Stable
Sweden	AAA	Stable
United Kingdom	AAA	Stable
Germany	AAA	Stable
Finland	AAA	Stable
Netherlands	AAA	Stable
Austria	AA+	Negative
France	AA	Stable
Belgium	AA	Negative
Ireland	A	Stable
Estonia	AA-	Stable
Slovak Republic	A	Positive
Slovenia	A-	Stable
Bulgaria	BB+	Stable
Latvia	A-	Stable
Lithuania	A-	Stable
Croatia	BB+	Stable
Romania	BBB-	Stable
Hungary	BB	Stable
Poland	A-	Positive

Source: S&P Statistics.

ANNEX 2

Shadow economy in selected European countries (2012) (%)

Country	Share of shadow economy
Denmark	13.4
Sweden	14.3
United Kingdom	10.1
Germany	13.3
Finland	13.3
Netherlands	9.5
Austria	7.6
France	10.8
Belgium	16.8
Ireland	12.7
Estonia	28.2
Slovak Republic	15.5
Slovenia	23.6
Bulgaria	31.9
Latvia	26.1
Lithuania	28.5
Croatia	29.0
Romania	29.1
Hungary	22.5
Poland	24.4

Source: Schneider (2013).

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Flight-to-quality or contagion effect? An analysis from the Turkish and the US financial markets

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Article**
JEL: G10, G11, G15
doi: 10.3326/fintp.39.3.4

* The author would like to thank two anonymous referees for their useful comments and suggestions.
** Received: June 3, 2015
Accepted: June 19, 2015

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39 (3) 325-340 (2015)

Abstract

In this paper, we investigate the presence of flight-to-quality from stocks to bonds as they are the two alternative asset classes predominantly used for hedging investment risk. A negative correlation between stock and bond markets is taken as a prognostication of flight-to-quality, while a positive correlation can be taken as a sign of contagion between the markets. We analyze the Turkish and US stock and government bond markets between June 6, 2006 and November 29, 2013, to make a comparison between the diversification benefits in a developed and an emerging market economy. We further divide our sample into two sub-periods to compare the patterns in crisis and tranquil periods. Our results reveal the existence of flight-to-quality in Turkey, whereas we find significant positive correlations between stocks and bonds in the US, implying a contagion effect. Additionally, we design portfolios of bonds/stocks and compute optimal weights and hedge ratios of the assets.

Keywords: bonds, stocks, portfolio investments

1 INTRODUCTION AND RELATED LITERATURE

Investors redesign their portfolios towards less risky assets at times of financial distress, a phenomenon referred to as "flight-to-quality". Baur and Lucey (2006) give a comprehensive definition of flight-to-quality, as the presence of decreasing correlations between stocks and bonds in the case of stock market plunges, resulting in negative correlation coefficients. By contrast, the authors relate decreasing correlation coefficients between the two asset classes at times of stock market mounts, to the phenomenon of "flight-from-quality". Following their stimulating study, we analyze the existence of flight-to-quality from stocks to bonds in Turkey and the US for the period between June 2006 and November 2013. Other than flight-to-quality and flight-from-quality, contagion between these markets is also corroborated in various studies (Kodres and Pritsker, 2002; Baur and Lucey, 2006). Negative contagion is described as increasing correlations during simultaneous stock and bond market collapses, whereas, positive contagion is identified by the increase in the correlations in joint market upswings.

Keim and Stambaugh (1986), Schwert (1989), Campbell and Ammer (1993) and Fleming et al. (1998) are among the pioneers in the study of the relationship between stock and bond markets. They are followed by Hartmann et al. (2001), Li (2002), Gulko (2002), Dopfel (2003), Baker and Wurgler (2006), Chulia and Torro (2008). Campbell and Ammer (1993) vindicate a low positive correlation between stocks and bonds over a sample period of 35 years (1952-1987) measured in monthly returns. Upon their findings for G-5 countries, Hartmann et al. (2001) suggest that "flight-to-quality is about as frequent as simultaneous crashes of stock and bond markets". Chordia et al. (2001) assert increasing correlations between both the bid-ask spreads and trading volume changes in the stock and bond markets during crises, using data over the period from 1991 to 1998. Li (2002) argues

that uncertainty about expected inflation is a major determinant of the correlation coefficient between stocks and bonds for a sample of G-7 countries. Gulko (2002) postulates that the correlation between stock and bond market returns is time-varying, dependent on the changes in the financial market dynamics and investor sentiments. He documents positive correlations between stock and bond markets in times of stock market crashes. Cappiello et al. (2006) find that at times of financial stress, the correlation between stocks and bonds tends to decrease. Goeij and Marquering (2004) investigate the asymmetric effects on the conditional covariances between the US stock and bond markets using weekly data over the period from 1987 to 1999. They provide evidence for asymmetric effects especially in the stock market, where bad news is followed by much higher conditional covariance between bonds and stocks than in the case of good news.

In their captivating study, Connolly et al. (2005) discuss the causes of positive and negative correlations between stocks and bonds, following the line of thought broached by Campbell and Ammer (1993). Under normal conditions, these two financial assets are positively correlated, since the variations in real interest rates affect their discount rates in the same direction. The expectations about future earnings will also have common influences on their returns. The only reason for a negative correlation between stocks and bonds is the differential response to inflation expectations. A change in the expected inflation leads to a certain change in bond prices, while the effect on stock prices is uncertain. An increase (decrease) in the inflation expectation will cause a decline (rise) in bond prices, but the impact on stock prices is ambiguous, as it is pertinent to industry and firm-specific conditions. The authors study the period from 1986 to 2000 in the US, when inflation was quite low and stable and yet they report time-varying and also sustained negative correlations between the two markets. Thus, they explain these results with cross-market hedging and flight-to-quality observed at times of increased volatility in stock markets. Their findings reveal that bond returns tend to be higher than stocks at times of higher uncertainty (measured by VIX, Chicago Board Options Exchange's Volatility Index). They also document a negative relation between uncertainty (VIX) and the future correlation between bonds and stocks. In an extension of their previous work, Connolly et al. (2007) study a sample of European countries (Belgium, Denmark, Germany, France, Italy, the Netherlands, Spain, Switzerland, the UK) along with the US between 1992 and 2002. They attest that increased stock market volatility leads to negative stock-bond correlations, in support of the findings of Kodres and Pritsker (2002) on cross-market hedging, with the argument that a shock in an asset market would be counteracted with price rebalancing in another market.

More recently, Dajcman (2012) investigates the co-movement between stock market returns and sovereign bond yields for Italy, Ireland, Portugal, Spain and Germany applying a DCC-GARCH model. He adduces time-varying correlations between stocks and bonds, and evinces the flight-to-quality phenomenon espe-

cially during 2008 crisis, with the exception of Germany, whereas the co-movement between stocks and bonds is positive. By contrast, Rösch and Kaserer (2013) depict the presence of flight-to-quality in German stock market in their study, where they use increasing liquidity costs in times of crises as an empirical evidence of default probability. Bianconi et al. (2013) investigate the BRIC (Brazil, Russia, India, China) countries and substantiate negative correlations between the bond and stock markets of both Russia and Brazil. However, the authors conclude that there are no significant correlations between Chinese and Indian stocks and bonds, a finding which they attribute to Chinese and Indian capital markets being relatively closed and state-controlled.

In this study, we investigate the presence of flight-to-quality in the US and Turkish financial markets. The US economy can be cited as one of the most developed economies in the world, while Turkey is described as an emerging market.[1] Applying Dynamic Conditional Correlation (DCC) – GARCH – GJR model, we find evidence of flight-to-quality and cross-market hedging in Turkey, whereas our results display contagion effects in the US, which may be a sign of market integration. Furthermore, we compute optimal weights and hedge ratios, and document that, in the Turkish financial markets, government bonds should outweigh stock investments in a hedged portfolio. On the contrary, ninety percent of the optimal portfolio should consist of stocks in the US, to minimize risk without lowering expected return. In this way, the empirical results of our study shed valuable insight on portfolio management and risk assessment.

The rest of the paper is organized as follows: part 2 describes the methodology. Part 3 presents the data analysis and the preliminary statistical tests. Parts 4 and 5 discusses the empirical findings and the results from optimal portfolio weight and hedge ratio computations, respectively. Finally, part 6 concludes.

2 METHODOLOGY

For analyzing shock and volatility spillovers between different time series, multivariate GARCH specifications are applied, such as the CCC-GARCH model of Bollerslev (1990) and the DCC-GARCH model of Engle (2002). In order to measure the time-varying correlations between bond and stock markets, we employ the dynamic conditional correlations (DCC) model proposed by Engle (2002). It

[1] The US economy has a pioneering role in global economic activity. Moreover, the US financial system is considered as the epicentre of the global financial crisis. That is the underlying reason for the selection of the US stock and bond markets as the crisis originating economy. Turkey is the 17th largest economy according to its GDP (IMF, 2014) and it is one of the members of the G20 countries. Among the emerging economies Turkey has a stock market (Borsa Istanbul) that is a potential alternative for the global investors with regard to its trading volume and possible benefits from portfolio diversification. The Turkish stock exchange market was established in 1985 and the market capitalization was $220 billion in 2014 (MKK, 2014). Foreign investors possess significant portfolio investments in the Turkish equity market, 62.3% and 64% of the total market capitalization in 2013 and 2014, respectively (MKK, 2014). The US investors constitute the largest group of foreign investors, controlling 33% of the equity investments in Borsa Istanbul (MKK, 2015). Hence, the comparative performance of the Turkish and the US financial markets has a significant importance for both the Turkish and the US investors and authorities, as well as for international portfolio managers.

provides two extra parameters, which are used to evaluate the effects of past innovations and past correlations on the current conditional correlations. The constant conditional correlation (CCC) model can be written as follows:

$$H_t = D_t R D_t \tag{1}$$

where R represents constant conditional correlation matrix and $D_t = diag(\sigma_{1t}, \sigma_{2t}, ..., \sigma_{Nt})$.

The dynamic conditional correlation (DCC) model can be described as follows:

$$H_t = D_t R_t D_t \tag{2}$$

where R_t is the time varying correlation matrix and D_t is the diagonal matrix of time varying standard deviations generated from the univariate GARCH model on each series.

The DCC framework consists of two stages. The first estimates the univariate GARCH model. In this paper, we consider Glosten, Jagannathan and Runkle's GJR (1993) model to account for possible leverage effects in the conditional volatility. Hence, the elements of matrix D_t are given by the GJR-GARCH(p,q) model as written below:

$$h_{it} = \omega_i + \alpha_i \varepsilon_{i,t-1}^2 + \gamma_i d\left(_i \varepsilon_{i,t-1} < 0\right) \varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1} \tag{3}$$

Where w_i, α_i and β_i are the model parameters, $d(\cdot)$ represents the indicator function (i.e. $d(\varepsilon_{t-1} < 0) = 1$ if $\varepsilon_{t-1} < 0$ and $d(\varepsilon_{t-1} < 0) = 0$, otherwise). Thus, the GJR-GARCH model permits good and bad news to have distinct effects on the conditional variance, known as "asymmetric" or "leverage" effect.

In the second stage estimation, the dynamic correlations are computed by the equations below:

$$Q_t = (1 - \sum_{m=1}^{M} \alpha_m - \sum_{n=1}^{N} \beta_n)\bar{Q} + \sum_{m=1}^{M} \alpha_m (\varepsilon_{t-m} \varepsilon_{t-m}^{'}) + \sum_{n=1}^{N} \beta_n Q_{t-n} \tag{4}$$

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1} \tag{5}$$

where M is the length of the innovation term in the DCC estimator, and N is the length of the lagged correlation matrices in the DCC estimator. $\bar{Q}$ is the unconditional covariance of the standardized residuals resulting from the first stage estimation and Q^*_t is a diagonal matrix composed of the square root of the diagonal elements of Q_t.

The log likelihood of the estimator is:

$$L = (-1/2)\sum_{t=1}^{T}(k\log(2\pi) + 2\log(|D_t|) + \log(|R_t|) + \varepsilon' R_t^{-1}\varepsilon_t) \quad (6)$$

where ε_t is the residual which is normally distributed with zero mean and a time varying variance and it is standardized by the conditional standard deviation.

In modelling the DCC-GARCH model, we assume conditional probability distribution density function of error terms which follow normal distribution, and the model is estimated with the quasi maximum likelihood (QMLE) method. In addition, we use the BHHH (Berndt, Hall, Hall and Hausman) iterative algorithm to obtain the optimal values of the parameters.

3 DATA ANALYSIS

In this study, we use daily data over the period from June 6, 2006 to November 29, 2013. The data set includes the 10-year government bond index of Turkey, the Borsa Istanbul composite index (BIST100), the 10-year government bond index of the US and Standard and Poor's 500 (S&P 500) index. All data are the closing prices of the relevant index. The prices are in US $ for S&P 500 and US bond index, whereas they are in Turkish Lira for BIST100 and Turkish bond index. We extract all relevant data from Bloomberg. The return series can be obtained as follows:

$$R_t = \ln\left(P_t / P_{t-1}\right) \quad (7)$$

where R_t denotes return, P_t and P_{t-1} represent price at time t and price at time $t-1$, respectively.

Table 1 gives the summary statistics of the return series. The mean values of the returns are -0.05% and 0.054% for Turkish bond and stock markets respectively and the standard deviations are 1.650 and 2.055 in the same order, while the mean values for US bond and stock markets are both 0, and the standard deviations are 0.023 and 0.014 respectively. In Turkey, bond returns are very slightly negative, and stock returns are considerably higher and both carry a much higher risk than US bonds and stocks. Moreover, excess kurtosis is computed for all the return variables, except the US bonds (greater than 3), implying a non-normal distribution. The rejection of the Jarque-Bera test statistics' null hypothesis also confirms the non-normality of the series. Typically, serial correlations on raw and squared data are found as the result of the Ljung-Box tests up to 10th lag. ARCH (10) tests indicate that the variables contain significant ARCH effects. Finally, the augmented-Dickey-Fuller (ADF) test applied to the return variables provide the rejection of unit-roots. Therefore, the return data are appropriate for GARCH-type modelling and further analysis.

TABLE 1
Descriptive statistics (%)

	BondTR	BIST100	BondUS	S&P500
Mean	-0.050	0.054	0.000	0.000
Minimum	-9.255	-14.65	-0.171	-0.094
Maximum	11.269	10.553	0.105	0.104
Std. dev.	1.650	2.055	0.023	0.014
Skew.	0.559	-0.780	-0.154	-0.391
Kurt.	7.322	7.112	2.968	8.908
J-B	3619.7[a]	3497[a]	694.39[a]	6235.2[a]
	(0.000)	(0.000)	(0.000)	(0.000)
ARCH (10)	21.699[a]	19.573[a]	15.160[a]	93.992[a]
	(0.000)	(0.000)	(0.000)	(0.000)
Q (10)	34.348[a]	38.707[a]	16.505[a]	62.435[a]
	(0.000)	(0.000)	(0.000)	(0.000)
Q2 (10)	387.000[a]	350.612[a]	293.339[a]	2018.40[a]
	(0.000)	(0.000)	(0.000)	(0.000)
ADF	-20.782[a]	-23.004[a]	-25.966[a]	-25.441[a]
	(0.000)	(0.000)	(0.000)	(0.000)

Robust standard errors are in parentheses.
[a]*Denotes the statistical significance at the 1% level.*

Source: Author's calculations.

Figure 1 displays the plots of our return series. As can be seen from the graphs, volatility increases in both the US and Turkish financial markets during the subprime mortgage crisis, and the trend dramatizes in the last quarter of 2008. The Eurozone crisis kindled by the Greek sovereign debt crisis paves the way to another high volatility episode in the second half of 2011 in both economies. Lastly, Turkish stock and bond markets witness another sheared interval in the second half of 2013, this time resulting from the political unrest in the country.

FIGURE 1
Return plots of the series

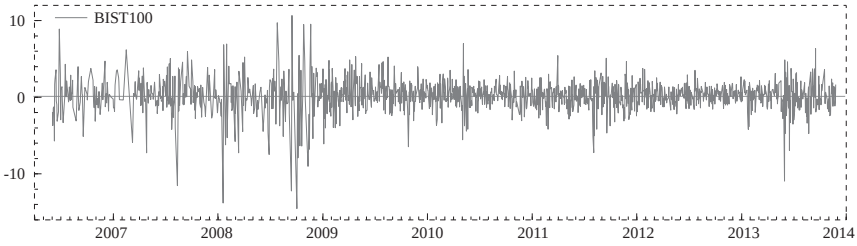
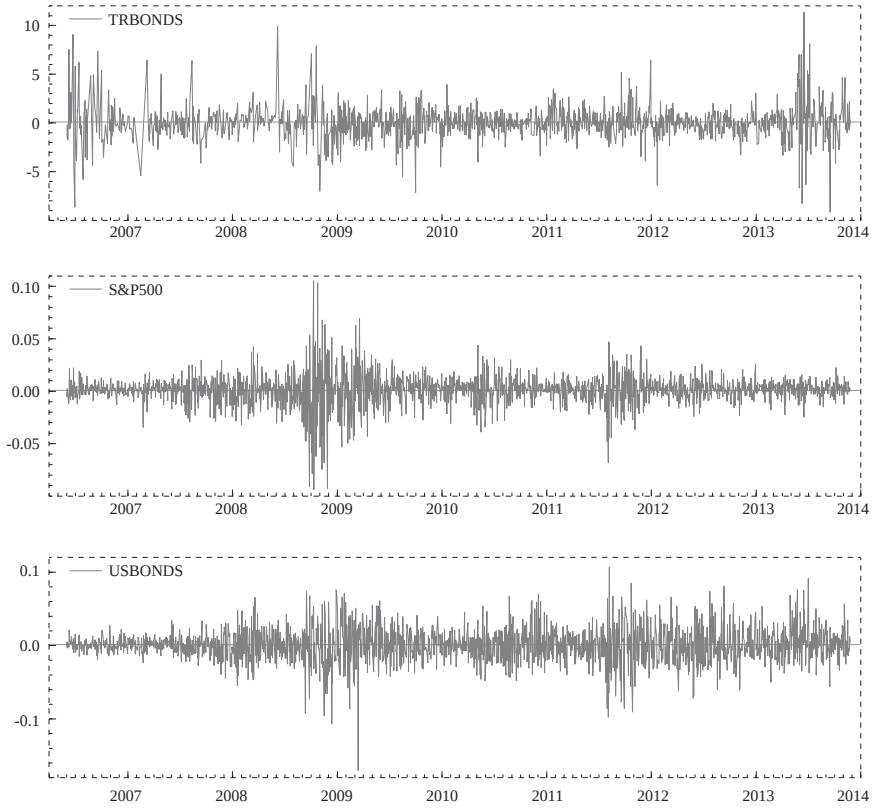


FIGURE 1 (continue)
Return plots of the series



Source: Author's calculations.

4 EMPIRICAL RESULTS

We give a thorough discussion of our empirical results in this section. In table 2a and 2b, we document the results of our DCC-GARCH-GJR (1, 1) models. The results for the full sample period are listed in table 2a, which denote that the parameters of the past shocks (α) and past volatilities (β) impact current conditional volatility in the univariate context. The asymmetry terms (γ) are all positive and significant, except for the Turkish bonds, indicating that the effect of the past negative shocks on the current conditional volatility is higher than that of the past positive shocks. The dynamic correlation coefficient between the Turkish bonds and stocks (ρ) is -0.494, and it is 0.430 between the US bonds and stocks, which are both significant at the 1% level. The parameters α and β of the DCC model are all significant and show that past shocks and one-lagged correlations impact the current conditional correlation. Our results reveal that, in the Turkish financial markets, flight-to-quality exists, while in the US, the contagion effect is prevalent during the period under investigation.

TABLE 2A

DCC (1, 1) Model results for the bonds-stocks pair

	Whole sample			
	BondTR	**BIST100**	**BondUS**	**S&P500**
C (M)	-0.091[a]	0.132[a]	0.000	0.000
	(0.006)	(0.000)	(0.219)	(0.246)
C (V)	0.044	0.147[b]	0.013	0.021[a]
	(0.359)	(0.024)	(0.128)	(0.000)
α	0.094[c]	0.073[a]	0.053[a]	-0.037[a]
	(0.085)	(0.000)	(0.000)	(0.000)
β	0.905[a]	0.820[a]	0.928[a]	0.916[a]
	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.027	0.155[c]	0.040[b]	0.202[a]
	(0.4304)	(0.057)	(0.024)	(0.000)
DCC parameters				
ρ	-0.494[a]		0.430[a]	
	(0.000)		(0.000)	
α	0.045[a]		0.0589[a]	
	(0.000)		(0.000)	
β	0.922[a]		0.911[a]	
	(0.000)		(0.000)	
Univariate diagnostic				
Q^2 (10)	5.684	7.790	3.471	8.476
	(0.841)	(0.649)	(0.968)	(0.582)
Multivariate diagnostics				
Hosking (10)	41.153		37.802	
	(0.334)		(0.478)	
Li-McLeod (10)	41.124		37.833	
	(0.335)		(0.477)	

Robust standard errors are in parentheses.
[a] indicates 1% significance, [b] 5% significance, and [c] 10% significance levels.
Source: Author's calculations.

In order to buttress the above findings, we divide our whole sample into two sub-periods. The first sub-sample covers the period between March 13, 2007 and August 12, 2009, witnessing the sub-prime mortgage crisis. The second sub-sample is between January 4, 2010 and November 29, 2013 which coincides with the aftermath of the crisis. We use the reports of the Bank of International Settlements (BIS, 2009) for the specification of the crisis and post-crisis periods.[2] Table 2b exhibits the results of these further analyses. Interestingly, for the crisis sub-sample, the α parameters are all statistically insignificant (except for the US bonds) and β parameters are all significant. Hence, the empirical findings indicate that past own shocks do not affect the current conditional volatilities (except for the

[2] GFC lasts through four phases with the first one, the "initial financial turmoil" which continues from the third quarter of 2007 to mid-September 2008, followed by the second phase, "sharp financial deterioration", until the end of 2008; the third phase, "macroeconomic deterioration", ends in the first quarter of 2009 and the fourth phase, "stabilization and tentative signs of recovery" lasts by the end of 2009.

US bonds), while own past volatilities display a profound impact on the current conditional volatilities. The γ terms are all insignificant, except for US stocks. The dynamic conditional correlation between Turkish bonds and stocks is -0.603, significant at the 1% level, indicating the flight-to-quality phenomenon in times of market distress. As postulated by Baur and Lucey (2006), decreasing correlations between the two assets at times of stock market plunges is an indication of flight-to-quality. The flight from stocks to bond investments at times of market turmoil places bonds as quality assets in the Turkish financial markets. On the other hand, the dynamic conditional correlation between the US bonds and stocks is 0.458, significant at the 1% level. This result confirms the existence of contagion in the US financial markets. Our results evince negative contagion in the US, with increasing correlations between the assets when the stock market collapses.

TABLE 2B

DCC (1, 1) Model results for the bonds-stocks pair

	Crisis period				Post-crisis period			
	BondTR	**BIST100**	**BondUS**	**S&P500**	**BondTR**	**BIST100**	**BondUS**	**S&P500**
C (M)	-0.112	0.180[c]	0.000	0.000	-0.081[b]	0.080	0.000	0.000
	(0.100)	(0.081)	(0.548)	(0.449)	(0.021)	(0.062)	(0.517)	(0.132)
C (V)	0.091	0.906[b]	0.032	0.030[b]	0.022	0.147[b]	0.114[c]	0.037[a]
	(0.272)	(0.029)	(0.275)	(0.043)	(0.164)	(0.045)	(0.086)	(0.000)
α	0.057	0.054	0.104[b]	-0.011	0.091[a]	0.019	0.051[b]	-0.068[a]
	(0.172)	(0.319)	(0.026)	(0.513)	(0.000)	(0.441)	(0.012)	(0.000)
β	0.927[a]	0.674[a]	0.884[a]	0.902[a]	0.911[a]	0.827[a]	0.915[a]	0.892[a]
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
γ	-0.043	0.322	0.039	0.197[a]	-0.021	0.180[b]	0.034	0.274[a]
	(0.239)	(0.137)	(0.480)	(0.000)	(0.460)	(0.024)	(0.156)	(0.000)
DCC parameters								
ρ	-0.603[a]		0.458[a]		-0.419[a]		0.503[a]	
	(0.000)		(0.000)		(0.000)		(0.000)	
α	0.076[a]		0.100[a]		0.032[b]		0.057[a]	
	(0.004)		(0.009)		(0.011)		(0.000)	
β	0.851[a]		0.737[a]		0.928[a]		0.913[a]	
	(0.000)		(0.000)		(0.000)		(0.000)	
Univariate diagnostic								
$Q^2(10)$	2.682	2.696	3.872	15.805	3.176	5.042	2.944	10.300
	(0.987)	(0.987)	(0.952)	(0.105)	(0.976)	(0.888)	(0.982)	(0.414)
Multivariate diagnostics								
Hosking (10)	17.638		45.995		31.865		41.996	
	(0.998)		(0.174)		(0.747)		(0.301)	
Li-McLeod (10)	17.875		46.013		31.938		42.027	
	(0.997)		(0.174)		(0.744)		(0.300)	

Robust standard errors are in parentheses.

[a] indicates 1% significance, [b] 5% significance, and [c] 10% significance levels.

Source: Author's calculations.

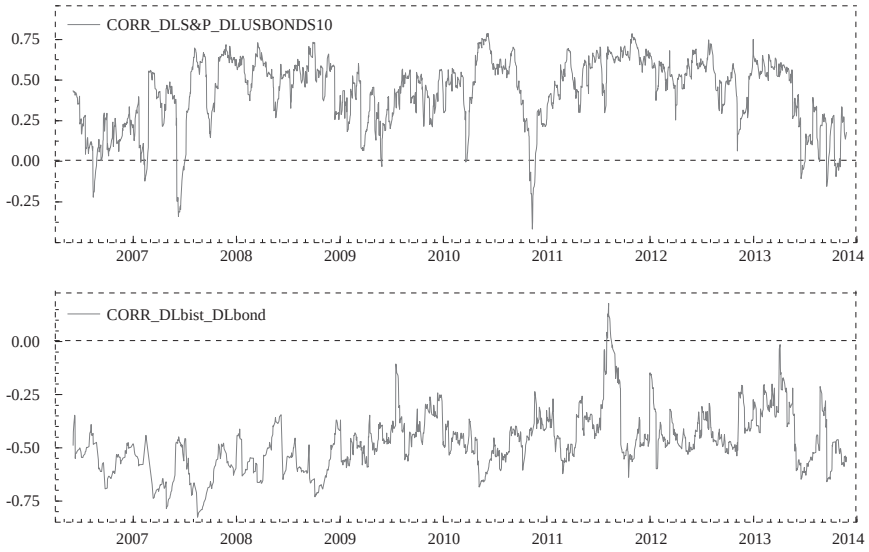
The results of the post-crisis period substantiate the above findings. During the post-crisis period the dynamic conditional correlations between bonds and stocks in both economies increase. Still, the coefficient is negative in the case of Turkey, showing that flight-to-quality continues to exist in the aftermath of the crisis. In the US, a higher positive correlation between the two markets signals positive contagion after the crisis episode. The β parameters indicate the significant effect of past own volatilities on current conditional volatilities. Apart from the Turkish stock market, the other variables are all affected by past own news. Both Turkish and the US stock markets exhibit asymmetry to past shocks in the post-crisis period.

In tables 2a and 2b, we also document the univariate and multivariate diagnostic test results applied to standardized squared residuals. The univariate tests of Ljung-Box Q (10) show no serial correlations in the squared residuals. Besides, the Hosking and Li-McLeod multivariate portmanteau tests, which are the extensions of the univariate Ljung-Box test, are applied to the squared residuals and the results posit that the fitted multivariate model is adequate to obtain the reliable parameters.

The above findings can be seen as visual representations in figure 2. The graphs represent the time varying evolution of conditional correlations between Turkish and the US bonds and stocks, respectively in the whole period. From the graphs, it can be seen that in the Turkish economy, negative correlations are prevalent during the sample period, while it is just the opposite in the US, where negative correlations are very rare.

FIGURE 2

Plots of time-varying correlations between bonds and stocks



Source: Author's calculations.

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5 HEDGE RATIOS AND OPTIMAL PORTFOLIO WEIGHTS

In this section, we elaborate on the connotations of our DCC-GARCH-GJR model results by designing optimal portfolios of both US and Turkish bonds-stocks. We construct two hedged portfolios; the first consists of Turkish 10-year government bonds and BIST100 index, and the second of US 10-year government bonds and the S&P500 index. By constructing hedged portfolios, the objective of minimizing the risk at the same expected return is sustained. Kroner and Ng (1998) propose the optimal holding weight calculations:

$$w_t^{bs} = \frac{h_t^s - h_t^{bs}}{h_t^b - 2h_t^{bs} + h_t^s} \tag{8}$$

and

$$w_t^{bs} = \begin{cases} 0, & if \;\; w_t^{bs} < 0 \\ w_t^{bs}, & if \;\; 0 \le w_t^{bs} \le 1 \\ 1, & if \;\; w_t^{bs} > 1 \end{cases} \tag{9}$$

where the w_t^{bs}, denotes the weight of government bonds in a one-dollar portfolio of bonds/stocks index at time *t*; h_t^b, h_t^s and h_t^{bs} are the conditional volatility of government bond index, the conditional volatility of the stock index and the conditional covariance between bond and stock returns at time *t*.

Kroner and Sultan (1993) compute the optimal hedge ratios of a two-asset portfolio in the following way:

$$\beta_t^{bs} = \frac{h_t^{bs}}{h_t^s} \tag{10}$$

β_t^{bs} indicates the amount of short position required in the government bonds to hedge the one-dollar long position in the stock market.

Table 3 depicts the average values of optimal weights and hedge ratios for the portfolios. The results show that the optimal weight of government bonds in the bonds/stocks portfolio is 0.251 in the US and 0.571 in Turkey. This denouement implies that to minimize risk at a given level of return, investors should hold more government bonds than stocks in Turkish financial markets. On the other hand, in the US, investors should hold more stocks, and only one-tenth of the portfolio should be invested in government bonds. These results are in line with our DCC GJR-GARCH model results. As we report a negative correlation between Turkish government bonds and stocks, the weight of government bond investments is higher than that of stocks in a hedged portfolio. On the other hand, the hedge ratio for bonds/stocks portfolio is -0.397, which means that one-dollar short position in Turkish stock market, should be matched by a long position of 39.7 cents in the bond market. Overall, our findings corroborate the flight-to-quality phenomenon in Turkish markets, where government bonds are regarded as quality assets, to reduce the portfolio risk especially in times of adverse market conditions. Thus in

Turkish financial markets, adding bonds in stock portfolios increases efficiency by lowering risk at the same expected return.

TABLE 3
Optimal portfolio weights and hedge ratios

	US bonds/stocks	TR bonds/stocks
w_t^{bs}	0.118	0.571
β_t^{bs}	0.905	-0.397

Source: Author's calculations.

6 CONCLUSION

The bond and the stock markets are the two main financial markets and have some common features, yet the assets traded in these markets indicate significant discrepancies between them, which lead to them being regarded as alternative investments. Investors switch between these alternatives to reduce risk at times of market distress. This study investigates the flight-to-quality phenomenon from stocks to bonds in two distinct economies, the US and Turkey. The US is one of the most developed economies in the world with voluminous financial markets. On the other hand, Turkey is an emerging economy, with relatively shallow financial markets that were established by the mid 1980s.[3] Hence, the results of our study provide a comparison between a developed and an emerging market in the context of cross-market hedging.

Our data period embraces the most recent crisis, starting by June 2006 and ending by November 2013. We take two sub-samples to make a profound analysis, with the first one, between March 2007 and August 2009, labelled as the crisis period. The second matches the post-crisis period, between January 2010 and November 2013. Overall, we posit significant results confirming the existence of flight-to-quality in the case of Turkey. We document negative correlations between Turkish government bonds and stocks, with a lower negative value during the crisis period. In contrast, our empirical findings demonstrate the contagion effect in the US, where the correlation between US government bonds and stocks are positive. The coefficient increases during the crisis, signalling the negative contagion effect. At the post-crisis period, the DCC-GARCH-GJR model results indicate a positive contagion in the US.

In order to assess the implications of our findings for portfolio management and hedging, we also compute the optimal weights and hedge ratios for the designed portfolios of government bonds and stocks for both the economies. Turkish government bonds outweigh stocks in the optimal portfolio with a hedge ratio of -0.397, implying that a one-dollar short in Turkish stocks should be matched by

[3] The S&P 500 has a total market capitalization above $15 trillion, almost 68 times higher than the Turkish stock exchange market (S&P Dow Jones Indices). Therefore, we describe the Turkish equity market as a "shallow market" in comparison to the S&P 500 index.

39.7 cents of long position in bond investments. On the other hand, according to the hedge ratio for the US government bonds-stocks portfolio, one-dollar long in US government bonds should be matched by 90.5 cents of short position in the S&P500 index. The weight of the US government bonds is only about ten percent of the optimal portfolio, as implied by the positive correlation between the assets. In this study, we posit a comparison between a developed and an emerging market in the context of cross-market hedging during the most recent financial crisis. Hence, our results provide insights for investors and portfolio managers to effectively implement diversification and hedging strategies in the international financial markets.

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Financing of Organised Crime

MICHAEL LEVI, OGNIAN SHENTOV
and BOYKO TODOROV (Eds.)
Center for the Study of Democracy, Sofia, 2015, pp. 463

Book review by PREDRAG BEJAKOVIĆ*
doi: 10.3326/fintp.39.3.5

* Received: June 5, 2015
Accepted: June 8, 2015

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FINANCIAL THEORY AND PRACTICE
39 (3) 341-347 (2015)

Almost on the same day there were two different events related to organised crime. On 7 April 2015 at the Bajakovo border crossing between Serbia and Croatia more than 140 kilograms of heroin was seized by the Croatian police. The drugs were hidden in the double bottom of a car driven by a 46-year-old citizen of Turkey, while in the passenger seat was a 26-year-old German citizen of Turkish origin. The market value of the seized drugs is estimated at more than HRK 42 million or 5.5 million euros.

A few days earlier, the Centre for the Study of Democracy from Sofia published a comprehensive and interesting book entitled *Financing of Organised Crime*[1]. Its editors are Michael Levi, Ognian Shentov and Boyko Todorov. Organised criminals need significant financial resources to start their business, to launch new products or cover new areas; to meet periodic financial needs, to cover any incidental or regular expenses and/or to support the potential vertical or horizontal expansion of their enterprise.

Various researches have shown that financiers are often behind the funding of large-scale trafficking of commodities like cigarettes or drugs. Although they have an important role in the whole business, financiers mostly remain outside the interest of analysis of organised crime at EU level and such information is largely omitted. Usually, legal enterprises secure external capital through borrowing, equity financing, or reinvestment of past internal profits. This raises the question about whether such possibilities also exist in illegal markets. Are there black market banks and investors? And, if this is the case, how do they differ from their legal counterparts?

The many authors in the book analyse three forms of organised crime: the illegal market of cocaine, the illegal market of a tobacco products and VAT fraud. The aim of the study is to examine the sources, mechanisms and approaches behind the financing of organised crime, through collecting and analysing empirical data in order to enable more effective investigations of organised crime and money laundering. Furthermore, the report also tries to scrutinise the possible interlocking relations between criminal structures and businesses and legitimate financial institutions; to examine cash flows in criminal enterprises and the costs and profits of doing illegal business.

The methodological approach of the study presented in the report includes a broad collection and use of a multiple set of both secondary and primary data. The data collection for the study was based on four key elements: published literature (different reports by academics, institutes, governments, law enforcement reports by EUROPOL, INTERPOL, National Crime; media sources in many EU member states; survey and follow-up interviews with law-enforcement, judicial, and other government officials; and case studies were performed for Belgium, Bulgaria,

[1] The book is available on: <http://www.csd.bg/artShow.php?id=17317>.

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Czech Republic, Estonia, France, Greece, Italy, Spain, Sweden and the United Kingdom. Each research partner – University of Trento, Italy; Teesside University, UK; and the Centre for the Study of Democracy, Bulgaria – was responsible for covering 9 EU member states and identifying potential respondents through their informal networks and official communications with the relevant governmental and law enforcement institutions.

From the various authority bodies in each EU member state, 8-10 persons were asked to take part in written interviews. They were officers in the police, financial police, border control, tax and customs authorities and officials from public prosecutors or organisations responsible for the fight against organised crime. Around one third of the persons invited returned their completed interviews. The second step of the data collection was to make further telephone interviews the goal of which was to enhance and broaden the information collected via the survey. The respondents were asked to explain and elaborate on the details provided and to illustrate the evidence with experiences from their practice. Of the 83 participants who returned the questionnaire, approximately 23% agreed to give fuller accounts in a more detail interview.

In 10 countries (Belgium, Bulgaria, Czech Republic, Estonia, France, Greece, Italy, Spain, Sweden and the United Kingdom) more detailed researches were carried out in at least one of the selected markets. These countries and the specific markets were determined by the initial stages of the research according to evidence from the literature review, statistical data and the availability of locally-based researchers. In-depth interviews were accomplished with country officials and other knowledgeable actors such as investigative journalists and business people, as well as criminal entrepreneurs. In-depth interviews with 225 participants were conducted in all 10 countries. Active criminal entrepreneurs were often identified from previous work in the field of organised crime and on some occasions these criminal entrepreneurs introduced acquaintances or collaborators to the researchers.

As the cocaine market is central to the global drug problem, after these introductory remarks and explanation of the methodology, the first chapter is dedicated to cocaine trafficking in Europe. Most data show that on a whole, this market is on the decline. Cocaine entering Europe is smuggled often by sea using container shipments, or through transport by air or postal services, as well as by using drug couriers (i.e. swallowers). Besides the more traditional entry points of cocaine into Western and Central Europe (primarily Portugal, Spain, the Netherlands and Belgium, which are countries for the further distribution of cocaine), the Black Sea area and the Balkans are more and more involved in the diversification of cocaine trafficking routes. A key entry point for cocaine directed to South-Eastern Europe is Greece, which has recorded some of the largest port seizures among all the countries. Studies conducted and data collected confirm the presence of fluid,

horizontal and loose criminal networks within the European cocaine market that have replaced the traditional hierarchical organisations. The first model has high levels of flexibility and adaptability regarding business opportunities and contingencies. It is structured into independent units – connected by key individuals (brokers) – with clearly defined roles and duties along the trafficking chain: managers coordinating group activities, persons organising logistics (like recovery and purchase of vehicles and equipment) or dealing with the recovery of drugs and/or money. Brokers are essential because they are responsible for the charges for connecting potential partners, buyers and suppliers, employees and employers and they need networking skills specifically adjusted to the cocaine business.

The Report explains the routes of trafficking operations and sources of capital for their financing and settlement of payments including advanced payments, revolving credits and multistep payment arrangements. Very interesting is the structure of the total costs, consisting of transhipment services (€10,000 to set up an import-export company) and payments to complicit legal entrepreneurs owning import-export companies at 30% of the value of the load; compensations to drug brokers, who earn from 3-4% up to 10% of the value of the load at the EU price; drug couriers are paid per trip with cash or with a percentage on the value of the transported loads, the prices of which range from €600-€6,000 per kilo transported within the EU; drug mules – swallowers that are paid per trip with travel and accommodation expenses covered from €2,000 to €3,000; money counters and collectors receiving €400 to €650 per day; money couriers earning around €1,000 (salary and expenses) per trip; bribes to officials in the range of from €1,000 to €10,000 per container; fees for protection: in order to ensure the security of the trafficking operations and the recovery of cocaine in the destination countries and other costs and fees in the form of a share of profits of the deal at around 10%.

Regardless of these costs, organised crime makes huge profits due to significant differences in the cocaine purchasing and selling price found in South America and EU countries. For instance, the cocaine retail price in the UK is €70,000 per kilo but it can be bought for around €2,700 in South America. Profits margins depend on several factors – availability of cocaine in an observed market, the retail prices (which differ in various EU markets), the quantity acquired, quality of the drug (level of purity), and risks taken/encountered (primarily seizures and arrests).

A very important factor is access to capital in critical moments because criminal entrepreneurs need to ensure the safety of trafficking (fees to competitive organisations, bribes to officials), and need to ensure consistent funding to continue the cocaine business. Financial resources are often invested in legal businesses entities that may serve for money laundering and/or facilitation of criminal activities. Despite critical moments, criminal entrepreneurs at all levels of the cocaine mar-

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ket seem to be able to continue with their criminal activity without facing any particular problems.

The second section of the book analyses the illegal trade in tobacco products. This is a manifestation of organised crime with a long history, one that has only relatively recently acquired academic and law enforcement attention. Four schemes characterise the illegal tobacco trade: *bootlegging* – buying an amount of cigarettes and tobacco that exceeds customs regulations; *large-scale smuggling* of untaxed tobacco products diverted from the licit international market; *counterfeiting* – the manufacturing of fake tobacco products; and selling legally manufactured cigarettes which are stolen. According to the available evidence, inflows from non-EU countries accounted for the bulk of illegally traded cigarettes in Mediterranean and Eastern border European Union member states. The worst situation is in Latvia where almost one third of all tobacco products are illegally traded. In Croatia the share mentioned is around 3.7%.

In the illegal trade in tobacco products the most critical issue is the financing of start-up capital. This is because once a smuggling operation is developed it can generate sufficient profit to allow further investment in schemes in a number of self-financing cycles. There is a wide range of financial sources used to initiate tobacco smuggling operations including funds from legitimate work and savings and/or funds from legal businesses that belong to, or are managed by, illicit tobacco entrepreneurs, but very often there are also a financing consortia. Interestingly, financing the illicit tobacco business from other illegal activities and businesses, is a rather uncommon source. Costs of the illegal trade in tobacco products consist, among other things, of expenditures for transporting and storing the merchandise, payment to actors and other costs for bribes, corruption, political protection, security and insurance.

For the readers of our Journal, the most interesting part is section 3 dedicated to organised VAT fraud. The EU has worked towards a common VAT anti-fraud strategy and recently strengthened anti-fraud measures. Two new directives were adopted by the Council in 2013: one introduced a quick reaction mechanism allowing member states to respond immediately to a sudden and massive VAT fraud; the other initiated the application of the reverse charge mechanism in relation to supplies of certain goods and services susceptible to fraud. Under this directive, member states have the possibility to apply this mechanism on a temporary basis and for a pre-agreed list of sectors and goods. The reverse charge mechanism requires that the liability for the payment of VAT is shifted from the supplier (as normally required by EU rules) to the customer.

Numbers of goods and services are affected by organised VAT fraud schemes. Because of their combination of small size and high price – which makes them convenient for simulating high value – mobile phones, computer and electronic

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components have often been used for VAT export frauds. Also used for the same purpose are railway vehicle components, scrap and precious metals, metal allocations and cars. Evasion of VAT is present in many forms, like fictitious exports, undervaluation of inputs and overvaluation of outputs to reduce tax liability, false classification of goods to take advantage of lower rates, declaration of false quantities and smuggling. One of the major organised crime threats present in EU member states is the missing trader intra-community (MTIC) fraud. Other models of fraud are *acquisition fraud* – the missing trader supplies the imported goods at the final consumption market and then disappears, embezzling all the due VAT debited; *carousel fraud* – the goods imported by the missing trader are sold through a chain of domestic companies ("buffers") and finally re-exported to another country with zero VAT rate; and *fictitious export* – a trader realises an export transaction on paper, levying zero VAT tax and claiming VAT refund to the tax authorities, while at the same time selling the goods on the domestic market without sales invoices. It is almost impossible to assess exactly the overall VAT gap, but according to the CPB Netherlands Bureau for Economic Policy Analysis from The Hague, for 2012 for the EU-27 it was estimated at 16% of the overall tax liability. The countries with the largest gap were Romania (44% of theoretical liability), followed by Slovakia (39%) and Lithuania (36%), while it is relatively low in Finland, the Netherlands and Luxembourg where the gap was around 5-6% of the VAT due.

The organisers of VAT frauds use different sources to acquire capital for starting and running their operations. The required capital comes from both legitimate and illegal sources. Professional crooks specialised in swindles, tax and customs duty frauds may work as ringleaders. The most common source of capital for initiating new VAT fraud schemes is achieved through re-investing the proceeds from previous fraudulent schemes. It is quite common for a legitimate entrepreneur to invest part of his or her legitimate revenues and/or personal savings to initiate a VAT fraud scheme. Various cases demonstrate that criminal entrepreneurs invest financial sources from other criminal activities. Apparently, well-established entrepreneurs with legitimate businesses may acquire financing through licit channels such as obtaining a bank loan. In Bulgaria, a ringleader of a big VAT fraud ring received €23 million in the form of bank guarantees and loans from a Bulgarian bank through two companies under his control. In Belgium and Spain actors asked for the help of illegal financiers or investors.

Operational costs usually consist of expenses such as the incorporation of fictitious companies, payments to straw men, proxy men, accountants, supervisors and facilitators, corruption fees. Since these costs are relatively low, many law enforcement experts believe that a VAT fraud project does not require substantial initial investments, while others state that this is true only in part. The profitability of VAT fraud depends on a number of factors such as the rate of VAT tax, the type of goods, the type of the fraudulent model and the scale of the fraud scheme and

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the number of actors involved. The gross profit is usually equal to the amount of the VAT tax embezzled and after the deduction of the business costs there remains a significant net profit.

Other parts of this interesting book present case studies of the criminal activities mentioned in the observed countries. The current report has provided a different perspective on criminal finances and an alternative approach for researching the subject. It also suggests possible steps toward the introduction of novel approaches to tackle organised crime. Building on the key findings from the study, the authors propose a set of recommendations at EU and national levels. Despite the inevitable caveats about a very under-researched component of criminal activity, the authors believe that their report provides sufficient information and analysis to stimulate more academic and practitioner research on these important topics.

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phone: +385 (0)1 4886 444; 4819 363; fax: +385 (0)1 4819 365
web-site: www.fintp.hr; e-mail: fintp@ijf.hr

Subscription
Annual subscription amounts 400 kuna
Payments to account no. HR7024840081100661775, Institut za javne financije, Zagreb; quoting: subscription to Financial Theory and Practice, 2015

Printed in 115 copies

The journal comes out four times a year

The journal is co-financed by the Ministry of Science, Education and Sport of the Republic of Croatia

Computer typesetting and printing
Denona d.o.o., Zagreb, Marina Getaldića 1