eFinanse
financial internet quarterly

SEEKING THE DIVERSIFICATION BENEFITS WITH FOREIGN EQUITIES AND COMMODITIES – THE CASE OF POLISH INVESTOR

Radosław Kurach[1]

Abstract

By estimating the correlation coefficients values we compare in this study the diversification potential of the different foreign equity markets and commodities. We present the findings that reflect the perspective of Polish investor. Our results are following: we identify a significant departure from normality in assets returns distributions, hence we provide an evidence on changing correlation patterns, which means varying diversification potential of different assets. We note that commodities are rather moderately correlated with the equity markets and the degree of comovement even diminish if we convert the USD prices into PLN ones. This phenomenon increases the potential for risk reduction of Polish investor.

JEL Classification: *F30, F36, G11*
Keywords: *foreign equities, commodities, diversification benefits*

Received: 22.12.2011 Accepted: 30.08.2012

Introduction[2]

The opportunity of global asset allocation has considerably expanded the set of potential investments. The purchases of foreign debt or equity instruments havetremendous consequences both for the economies and investors itself. As Baele, Ferrando, Hördahl, Krylova, Monnet (2004) point out this phenomenon results in the improved allocation of capital as the shares of the most effective companies becomes available for more investors. There is also a theoretical link between international investing and economic growth. Higher cross-border capital flows in some regions lead to financial sector development, which further support economic growth. This point of view, where creation of financial institutions and markets causes a real sphere growth is known as *supply-leading hypothesis*, as labeled by Patrick (1972). Last but not least, when investors are able to allocate their funds cross-country, the idiosyncratic (local) risks are diversified away resulting in the improvement of risk-return relationship of the investment portfolios. In a macro scale, the outcome of this phenomenon should be the inter-temporal smoothness of the consumption level. In this paper we would like to discuss this last consequence of international investing *i.e.* an improvement in the mean-variance trade-off. In his seminal paper Markowitz (1952) concluded that when assets returns are not perfectly correlated, diversification benefit (reducing portfolio risk while keeping the return constant) can be achieved. Lower the correlation coefficient, larger the gain, hence an investor should look for the assets that are not moving together. In the early studies international diversification of the equities portfolio was believed to deliver the desired diversification results (Grubel, 1968, Levy and Sarnat,

[1] Ph. D., Radosław Kurach, Wroclaw University of Economics, ul. Komandorska 118/120, 53-345 Wrocław, radoslaw.kurach@ue.wroc.pl.

[2] The 'Introduction' and 'Commodities in a portfolio context' have been partly based on the other author's other study – Kurach (2012).

1970). To understand the rationale of international investing one should think about the determinants of equity valuation. As equities are the means of property rights in the company, which is valued higher whenever it is able to generate higher profit, it is not surprising that stocks' returns are merely driven by business cycle fluctuations. However, due to information efficiency of the financial markets, equities' valuation reflects the expected state of the economy rather than current macroeconomic conditions. That is why stock market indices are often considered as leading indicators of the business cycle[3]. Equity prices are the lowest before the economy reaches its bottom. As the economic growth accelerates and GDP rate of growth exceeds the potential output growth, equities reach its peak. According to Aggregate Demand-Aggregate Supply (AD-AS), a popular macroeconomic model, in this phase of the business cycle inflation pressure start to emerge. Therefore, stocks are considered usually as poor inflation-hedgers. In the international context when investors are able to purchase equities in countries having diverging business cycles, it is possible that their stock markets also exhibit low correlation and the portfolio risk may be reduced. Nevertheless we should think, if the business cycles in the contemporary world are really so different?

In the last twenty years numerous studies noted rising business cycle dependence. Artis, Chouliarakis and Harischandra (2009) analyzed the macro data across 25 emerging and advanced economies. In some cases the available time series were even 125 years long. Artis *et al.* (2009) observed rising business cycle correlations since 50s and accelerating since 1973, but mainly within a group of European and a group of English-speaking economies. Other empirical studies list the possible determinants of this phenomenon. Perhaps the most frequently discussed causes are foreign trade deepening (Baxter and Kouparitsas, 2004) and liberalization of capital accounts (Imbs, 2003). However, even the potentially unrelated factors can support the process of rising GDP correlation. Flood and Rose (2010) present the theoretical model and deliver some empirical support regarding the inflation targeting framework. According to their study, this popular strategy in modern central banking leads to higher business cycles synchronization than any other monetary policy framework. Finally, as we can expect since the mid-nineties (Sinquefield, 1996) the research started to confirm also the diminishing diversification benefits from international equity investing and the numerous papers emerged in the last years (Niemczak, 2010; Chollete et al., 2012; Christoffersen et al., 2012).

We can now presume that the type of the asset rather than domicile of the securities' issuer should be the dominant criterion for assets allocation decisions while seeking for diversification opportunities. In this study we would like to focus our attention on commodity investments.

The literature verifying the diversification gains from investing in commodities is relatively scare comparing to the set of papers assessing the risk-reduction potential of international equity investing. The existing literature, however, confirm low correlations of commodities with the traditional investing assets like stocks and bonds (Idzorek, 2006; Laws and Thomson, 2007). We also investigate empirically commoditiy and equitiy returns comovement, but we extend the existing literature in two areas.

First of all, we present the conclusions from the Polish investor point of view. The vast majority of the existing studies analyze the international investing diversification gains of the US investor. We argue that due to exchange rate fluctuations the diversification benefits of US and emerging market investors vary remarkably, being higher in this latter case. While the correlations of equity and commodity USD denominated[4] returns are moderate, the same statistic in case of PLN denominated returns is even lower.

[3] For example an index of 500 common stocks is one of the components of the well recognized in financial world The Conference Board Leading Economic Index® (http://www.conference-board.org/).

[4] 'USD (PLN) denominated returns' means returns calculated with USD (PLN) denominated indices values. Of course rate of return does not have any currency unit, however this abbreviation seems to be a useful one.

Secondly, we analyze the skewness and kurtosis of returns distributions concluding that the assumption of multivariate normality should be rejected. Therefore the values of correlation coefficients and consequently the diversification benefits are time-varying. We confirm that during financial market plunges equity markets correlation rise, but this rule does not fully apply to the comovement between equities and commodities.
The paper continues as follows. In Section 2 we provide some theoretical explanation of low correlations between commodities and other assets. Section 3 describes how to obtain the exposure to commodities. In section 4. we analyze the correlations between commodities and equity indices delivering the proof of time-varying diversification benefits. Section 5 contains the investment results of portfolios with- and without commodities assets during the recent financial market turmoil. Section 6 concludes the study.

Commodities in a portfolio context

Commodities react to business cycle differently than stocks and bonds, hence we should expect here potential diversification benefits. Anson (2009, p. 329-332) names three reasons why this might be true.
First of all, inflation usually leads to higher commodities prices, while having the detrimental impact on the stocks and bonds values. Frequently, rising commodities prices are the source of inflation itself (negative supply shocks). It is also worth of mentioning that in the inflationary times investors prefer real (tangible) assets than capital ones (Feldstein, 1981).
Secondly, commodities reflect short-term expectations, while stocks and bonds valuation is driven mainly by rather long-term forecasts. For example rising inflation expectations due to overheating the economy leads to an increase supply of stocks and bonds. On the other hand commodities should react positively as it indicates higher demand for raw materials. The research conducted by Goldman Sachs&Co. (1996), Gorton and Rouwenhorst (2005) confirmed countercyclical movement of traditional investing assets and found commodities responding positively to current macroeconomic conditions.
The last argument is based on economic production process. The neoclassical theory states that marginal revenue (price) should equal the marginal cost. Having three factors of production, namely capital, labor, and raw materials, the returns to these three factors should equal the price of production. Assuming sticky wages in the short run, which is not very strong assumption, for any given price level an increase in the return to capital must be compensated by a decrease in the return to raw material and vice versa. Therefore, capital assets (stocks and bonds) should be negatively correlated with commodities.

Looking for an exposure to commodities

Commodities are still rather unpopular assets among investors. One of the reasons is perhaps lack of appropriate knowledge about the determinants of commodities valuation. However, for many investors it can be also unclear how to obtain an exposure to commodities price risk. Therefore, some systematization in this area is needed. Laws and Thompson (2007) list three ways of acquiring commodities volatility: direct physical investment, commodity related stocks and finally commodity futures.
Purchasing an underlying commodity seems to be the most straightforward method, but at the same time the most problematic. The owner of the physical assets should take into account the transportation and storage costs. The perishable nature of many commodities is also another risk for a potential investor. As a matter of a fact this way of obtaining the exposure is rarely used.
It also makes sense to invest in the equities of the commodities related companies. In case of Poland, the investors looking for an exposure to copper prices frequently buy stocks of KGHM

– one of the biggest producers of this metal in the world. We should note this track is associated with some other risks making the exposure to commodity price volatility quite problematic. Let's now focus on KGHM case.

As every stock, also the metal producer company is driven by systematic and specific risks. Applying the fundamental concept of Diagonal Model[5] as proposed by Sharpe (1963) we can estimate the proportion of total equity's volatility explained by factors common for the broad stock market. The model's equation presents as follows:

$$R_i = \alpha_i + \beta_i R_M + \varepsilon_i, \quad (1)$$

where

R_i is the return of security *i*,

α_i and β_i are the parameters of the equation,

ε_i is the error term distributed $N\sim(0,\sigma_\varepsilon)$ and

R_M is the return of some market index.

In our case R_i is the weekly return of KGHM (in PLN) and R_M is the weekly return of MSCI Poland index (in PLN). If the classical assumptions of regression analysis are satisfied, the variance of stocks returns is the sum of two components:

$$V(R_i) = \beta_i^2 V(R_M) + V(\varepsilon_i), \quad (2)$$

Hence, the proportion of total variance explained by general stock market volatility is the determination coefficient of the estimated equation (1):

$$R^2 = \frac{\beta_i^2 V(R_M)}{V(R_i)} \quad (3)$$

Additionally, we make the same estimation, but using the copper prices as R_M. In one specification copper is denominated in USD, in another in PLN. The results of our analysis are following:

Table 1: Estimation results

	Model 1	**Model 2**	**Model 3**
R_i	KGHM (PLN)	KGHM (PLN)	KGHM (PLN)
R_M	MSCI Poland (PLN)	Copper (PLN)	Copper (USD)
β_i	1,26	0,79	0,92
R^2	48,7%	17,4%	31,4%

Note: Data period covers weekly returns from 31.12.1999-31.12.2010. As a proxy of Copper prices we used London Metal Exchange-Copper, Grade A Cash United States Dollar Per Metric Tonne. Beta in every case is significant at 1% level

Source: Own study

Looking at determination coefficients values we note KGHM is definitely more exposed to broad stock market risk rather than to volatility of copper returns. In every specification we also

[5] Diagonal Model is the name proposed by Sharpe (1963). The other names for this concept that can be found in the literature are Single-Index Model or simply Sharpe's Model.

identify a large portion of risk that is not explained by the model and may be driven by company's specific factors like managerial skills[6]. What is also worth underlining beta parameter in case of models 2 and 3 is less than one. It means that KGHM response moderately to changes in copper prices. That is probably because to some extent copper prices may be hedged by the company. This circumstance additionally reduces the potential exposure to commodity risk.
The third and probably the most recommended way of obtaining the commodities exposure is based on use of commodity futures contracts. These instruments have more advantages than shortcomings comparing to the previously discussed methods. Futures are traded on the organized exchange. This results in transparent pricing, clearinghouse security, uniform contract size and terms, and daily liquidity. What is even more important, investing in futures contracts does not require automatic delivery of the underlying commodity. Investor needs only to remember about initiating the offsetting position that will close out the position of the initial futures contract. However, if investor wishes to maintain his exposure to commodity prices for a long time without taking physical delivery of the underlying contract, he will have to close out his existing futures position and reestablish a new position by entering into a new futures contract. Depending on the term structure of the futures prices this process can be costly (Anson, 2009, p. 313-314).

Measuring the interdependence

Frequently in many financial market models economists assume assets returns to be multivariate normally distributed. This assumption is vital for using correlation coefficient as a measure of returns comovement. As Rey (2000) points out, if returns are drawn from a symmetric distribution such as multivariate normal one, correlations should be the same for every sub-period. We argue this is not the case. We demonstrate a time-varying dependence structure of international equity and commodity returns and at the same time changing diversification potential of different assets.

Data description

In our study we use weekly returns of stock market and commodity indices[7]. Due to availability of data for the emerging market economies the sample period starts at the beginning of 1995 and lasts till the end of 2010. We present the results from Polish investor perspective, hence we convert US-dollar (USD) denominated indices to Polish Zloty (PLN). Similarly to many studies on international finance we investigate equity returns indices provided by Morgan Stanley Capital International (MSCI).
To verify the diversification potential for Polish investor we analyse dependence structure between Poland (PL) and some regional indices, namely: World (WRD) (a set of stocks of all the 24 developed markets in the world, as defined by MSCI), Emerging Markets Asia (EMA), Emerging Markets Europe (EME) and BRIC (Brazil, Russia, India, China). As a proxy of the broad commodity exposure we decide to utilize Standard&Poors Total Return Goldman Sachs Commodity Index (GSCI). This index is frequently used as a benchmark for commodities investment comprising:

[6] This company-specific risk may be diversified by keeping the portfolio of commodities related stocks.
[7] It is not recommended to use daily data for international comparisons because of different time zones across the world.

as many commodities as possible, with the rules excluding commodities only to retain liquidity and investability in the underlying futures markets. Currently, the GSCI contains 24 commodities from all commodity sectors: six energy products, five industrial metals, eight agricultural products, three livestock products and two precious metals. This broad range of constituent commodities provides the GSCI with a high level of diversification, both across sub-sectors and within each sub-sector. This diversity minimizes the effects of highly idiosyncratic events, which have large implications for the individual commodity markets but are muted when aggregated to the level of the GSCI.

(Obtained from:http://www2.goldmansachs.com/what-we-do/securities/products-and-business-groups/products/gsci/approach.html)

All of the employed time series were obtained from Thomson Reuters Datastream.

The empirics

Table 2: Summary statistics for weekly returns (1995-2010)

Index	PL	BRIC	EMA	EME	WRD	GSCI
Mean (% ann)	7,61	9,57	3,03	11,78	5,92	6,44
Std. dev. (% ann)	30,30	25,80	23,95	28,15	16,52	22,54
Skewness	0,03	-0,32	-0,13	0,09	-0,14	-0,28
Kurtosis	1,84	1,61	1,74	6,82	3,96	2,40
Jarque-Bera	117,95	103,77	107,86	1617,40	308,01	212,05
p-value	0,000	0,000	0,000	0,000	0,000	0,000

Note: For all estimates in this table we used PLN denominated returns.

Source: Own study

The annualized returns vary significantly from the lowest 3,03% for Emerging Markets Asia to 11,78% in case of Emerging Markets Europe. Probably the experience of Financial Crisis in 1997 and 98 seriously affected the **results** in the Asian case. The lowest volatility in case of World index is not surprising for two reasons. First, It covers developed markets, which are usually less volatile. Second, comprising 24 economies it is very likely that country-specific risks are mostly diversified. The similar diversification remark applies to commodity index, where we note the second lowest volatility.

In case of normal distribution the values of skewness and kurtosis statistics should be zero. As we expected the reported values of these parameters are mostly far from zero. In case of skewness for two indices we find slightly positive numbers (PL and EME) while for the rest four series the estimates are negative indicating that returns distributions are skewed to the left. On the other hand for all of the investigated series the values of kurtosis are well above zero. Hence, the analyzed distributions have a more acute peak around the mean and fatter tails comparing to normal one. Finally the Jarque-Bera test reject the null hypothesis on normality at 1% significance level (*p-value* lower than 0,01).

The next step of our analysis address the question of interdependence. We start from estimating the correlation matrix for the whole sample.

Table 3: Pearson's correlation coefficients (1995-2010, weekly, PLN)

	PL	BRIC	EMA	EME	WRD	GSCI
PL	1					
BRIC	0,408016	1				
EMA	0,358872	0,663682	1			
EME	0,593528	0,636709	0,44525	1		
WRD	0,298751	0,586996	0,580245	0,456788	1	
GSCI	0,015686	0,203896	0,165763	0,174499	0,239128	1

Note: For all estimates in this table we used PLN denominated returns.

Source: Own study

Table 4: Pearson's correlation coefficients (1995-2010, weekly, USD)

	PL	BRIC	EMA	EME	WRD	GSCI
PL	1					
BRIC	0,563446	1				
EMA	0,523608	0,718439	1			
EME	0,705379	0,723744	0,567556	1		
WRD	0,55891	0,69077	0,622147	0,642974	1	
GSCI	0,248242	0,315605	0,22113	0,343709	0,284385	1

Note: For all estimates in this table we used USD denominated returns.

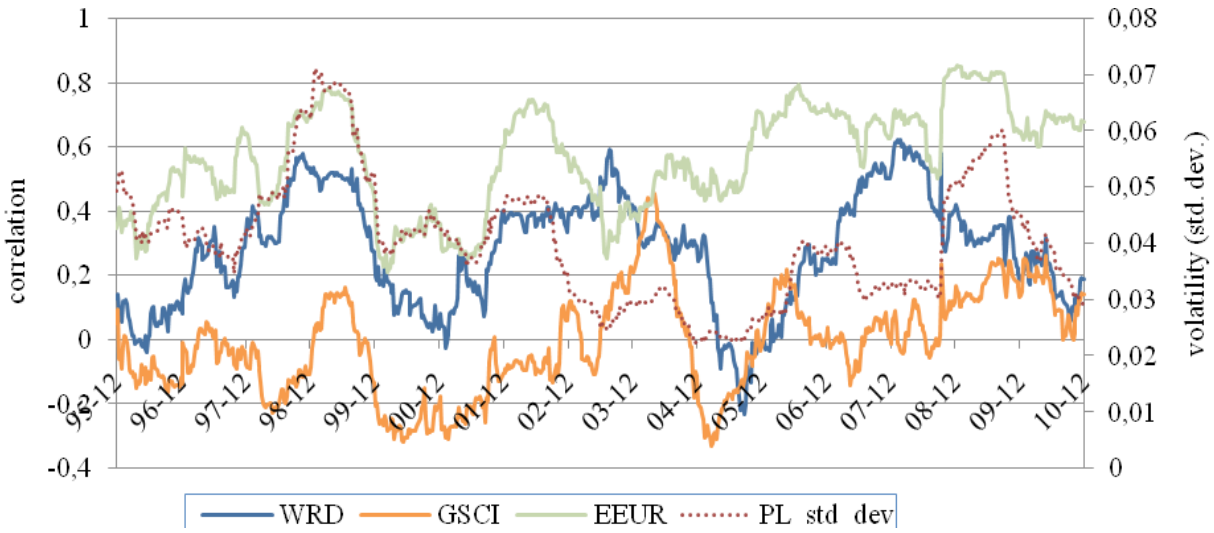
Source: Own study

For every stock market we observe the lowest correlation with commodities index. In case of Poland we observe also higher comovement with other emerging markets than with an index of developed economies.

What is also appealing the values of correlation coefficients rise if the returns are denominated in USD. Probably the following mechanism is in work: whenever global risk aversion rises, the capital flows to the US T-bonds market as well as to some markets of raw materials (gold, silver). This leads to the appreciation of US dollar against emerging market currencies. Hence, USD appreciation effect neutralizes falling US equities' prices from the perspective of emerging market investor. To sum up this point, international diversification opportunities for the emerging market investor are definitely higher than for the American one due to the exchange rate fluctuations.

We identified, however, a significant departure from normality of the analyzed returns distributions. Probably the values reported in Tables 3 and 4 are to some extent misguiding and should be treated rather as the average degree of comovemement. The following chart illustrates that in fact correlation coefficients are highly time-varying:

Chart 1: Time-varying Pearson's correlations and volatility



Note: 'WRD', 'GSCI', 'EEUR' series are rolling Pearson's correlations between the PL and WRD, GSCI, EEUR weekly returns. 'PL_std_dev' is rolling standard deviation of weekly PL returns. The length of rolling window in every case is 52 observations (52 weeks). For all estimates presented in this chart we used PLN denominated returns.

Source: Own study

The visual inspection of Chart 1 clearly indicates that correlation coefficients exhibit a large degree of instability. What is more important rising standard deviation of PL returns is accompanied by rising interdependence. This brief analysis indicates that during extreme market moves the diversification opportunities diminish. It is therefore tempting to verify if the reduction of diversification potential is the highest when we face large positive returns or if we experience financial market plunges, when in fact low correlations are the most desirable. To check the pattern of changing correlations we apply the semi-correlation (conditional) measure (Rey 2000) defined in the following way:

$$\rho_{i,j}|\underline{\Theta} < R_j < \overline{\Theta} = \frac{E\left[\left(R_j - \bar{R}_j|\underline{\Theta} < R_j < \overline{\Theta}\right)(R_i - \bar{R}_i)\right]}{\sqrt{E\left[\left(R_j - \bar{R}_j\right)^2|\underline{\Theta} < R_j < \overline{\Theta}\right]}\sqrt{E(R_i - \bar{R}_i)^2}}$$

with $\underline{\Theta} = -\infty$ for $\overline{\Theta} = -8{,}2617\%, (a), -4{,}0603\%\ (b), 0{,}1411\%\ (c)$

and $\overline{\Theta} = +\infty$ for $\underline{\Theta} = 0{,}1411\%\ (d), 4{,}3425\%$ (e), 8,5436% (f), (4)

where

R_j – is the weekly return of index *j*,

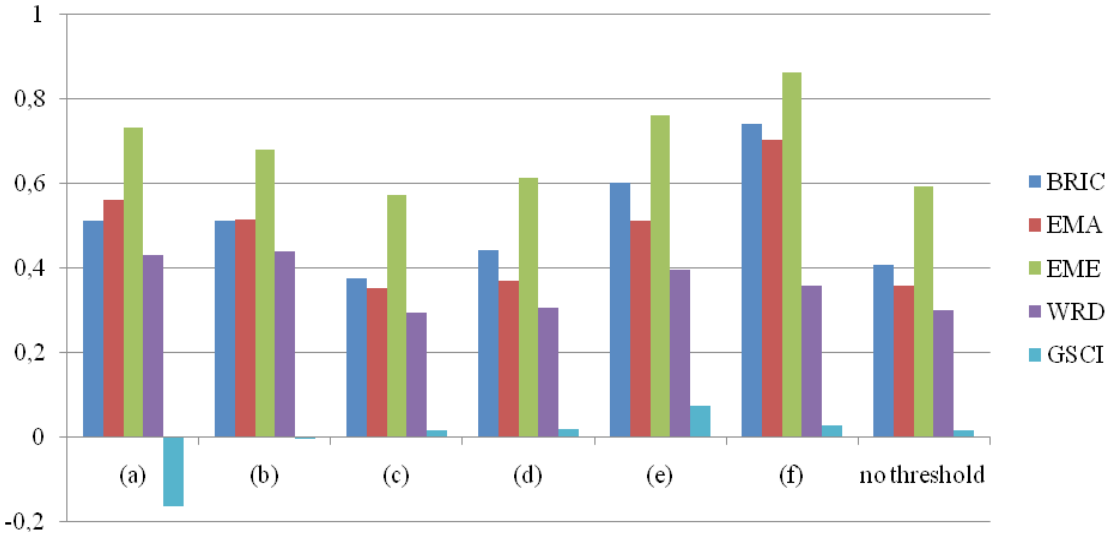
$\bar{R}_j$- is the average weekly return of index *j*,

R_i – is the weekly return of index *i*,

$\bar{R}_i$- is the average weekly return of index *i*.

In this study *j* applies to PL returns, while *i* denotes the other analyzed indices, namely BRIC, EMA, EME, WRD, GSCI. Presenting the perspective of Polish investor we define the extreme event when the weekly return of Polish stock market (*j*) exceeds a given threshold. In our case the threshold values are based on standard deviations of weekly PL returns, where (a) and (f) denote – and + two standard deviations respectively, (b) and (e) stand for one standard deviation, (c) and (d) are the mean values of weekly returns. The results of semi-correlation analysis have been presented on Chart 2.

Chart 2: Semi-correlation between PL and other indices (1995-2010, weekly, PLN)



Note: (a), (b), (c), (d), (e), (f) apply to threshold values defined in equation (4). To enable a comparison 'no threshold' denotes the values of the unconditional correlation coefficients as presented in Table 3. For all estimates presented in this chart we used PLN denominated returns.

Source: Own study

It is no surprising to see rising semi-correlation values whenever we increase the absolute value of the threshold level. As the conventional wisdom states "low correlations disappear when we need them the most" we expected to note the highest interdependence in case of market plunges, but this is only in case of WRD returns. However, the most surprising result applies to semi-correlation values between PL and GSCI returns. We see that the most severe negative Polish stock market returns were accompanied by the commodities prices moving slightly in the opposite direction. At the same time it was the lowest value of semi-correlation between PL and GSCI returns for any given threshold, making the commodities investment additionally attractive for Polish investor seeking the diversification benefits.

The financial turmoil

For the last years we have been witnessing the unprecedented global financial market crisis. It started its "career" as the "subprime crisis" in 2007 and changed into a "sovereign debt crisis" about 2009-10. During these years the financial assets experienced a heavy loss in value. The conventional measures of portfolios performance (*e.g.* Sharp's and Treynor's ratios) applied to these extreme data would not deliver the interpretable results, as in most cases the portfolio rate of return would be lower than a risk free rate. Therefore, we decided to verify the portfolios' performance looking at their average returns and Value at Risk (VaR) statistic, which is broadly used as a measure of the downside portfolio performance. In other words, we check in which case we would lose less.

$VaR_{T,\alpha}$ is a loss estimate from a fixed set of assets over a fixed time horizon T that would be equalled or exceeded with a specified probability α. If we would like to express VaR in terms of rate of return, VaR would be one of the lowest percentiles of the portfolio's returns distribution. If $\alpha = 0{,}05$, VaR is the fifth percentile.

We created the set of portfolios, anytime with the dominant share of Polish stocks to reflect the well-recognized phenomenon of home bias. The other components are GSCI or WRD assets

which were found to have the lowest correlation with PL index over the long run. For the years 2007-2010 we calculated the weekly portfolio returns assuming fixed portfolios' weights for the entire investment period. The results of VaR estimates are then following:

Table 5: Pearson's correlation coefficients (2007-2010, weekly, PLN)

	Portfolio 1		**Portfolio 2**		**Portfolio 3**		**Portfolio 4**		**Portfolio 5**		**Portfolio 6**	
	90% PL	10% GSCI	80% PL	20% GSCI	70% PL	30% GSCI	90% PL	10% WRD	80% PL	20% WRD	70% PL	30% WRD
Mean	-0,0654		-0,0541		-0,0452		-0,0703		-0,0629		-0,0571	
Std. dev.	3,7196		3,4222		3,1755		3,7495		3,4611		3,1968	
$VaR_{0,05}$	-5,95		-5,66		-5,26		-6,00		-5,71		-5,15	

Note: '$VaR_{0,05}$' denotes the fifth percentile of the weekly returns historical distribution over the period 2007-2010. All numbers are expressed in percentage points. For all estimates in this table we used PLN denominated returns.

Source: Own study

We note lower mean returns for the portfolios containing WRD assets comparing to the GSCI portfolios for any given weight of Polish equities. In case of two WRD portfolios we also observe lower $VaR_{0,05}$. Therefore the commodities were found again to deliver better diversification outcomes than an international set of stocks.

Conclusions

In this study we identified two general investing patterns. First of all, the diversification possibilities vary remarkably for the investors in different countries, if the exchange rate risk is left unhedged. Then, we gave an evidence that local equity markets as proxied by regional and country indices exhibit a lesser degree of comovement with commodities comparing to the comovement with foreign stock markets. The observe phenomena tend to look for the practical implementation and at the same time rise some new questions.

The diversification potential of commodities should be noted by governments while establishing the investment limits for the pension fund portfolios. As we presented, increasing the limits of foreign equity investments will not deliver very significant risk-reduction results and may be justified only when the local equity markets are not deep enough. In such case, the foreign equity investment opportunity prevents emerging the asset bubbles on the local market rather than deliver the desired diversification benefits. Therefore, it is more plausible to put a higher weight on foreign commodity investments[8].

It is also tempting to verify the diversification potential of the single commodities. GSCI is in fact a very broad set of 24 assets and it is quite possible that some of these assets react differently (different lead or lag) to the business cycle fluctuations than the other index components. However, this issue will be analyzed in further research[9].

[8] Following the sentence from 21st Dec 2011 of Court of Justice of the European Union Poland has to remove the limits of foreign investments by Polish open pension funds. (http://curia.europa.eu/juris/liste.jsf?pro=&lgrec=pl&nat=&oqp=&dates=&lg=&language=en&jur=C%2CT%2CF&cit=none%252CC%252CCJ%252CR%252C2008E%252C%252C%252C%252C%252C%252C%252C%252C%252C%252Ctrue%252Cfalse%252Cfalse&num=C-271%252F09&td=ALL&pcs=O&avg=&page=1&mat=or&jge=&for=&cid=21877).

[9] See: Kurach (2012).

Acknowledgment

The authors would like to acknowledge two anonymous reviewers for their valuable comments.

References

Anson, M. J. P. (2009). CAIA Level I. An Introduction to Core Topics in Alternative Investments. Hoboken. New Jersey: John Wiley & Sons.

Artis, M., Chouliarakis, G., Harischandra, P. (2009). Business Cycle Synchronization Since 1880. Centre for Growth and Business Cycle Research Discussion Paper Series, 153.

Baele, L., Ferrando, A., Hördahl, P., Krylova, E., Monnet, C. (2004). Measuring Financial Integration in the Euro Area. European Central Bank Occasional Paper Series, 14.

Baxter, M., Kouparitsas, M. A. (2005). Determinants of Business Cycle Comovement: a Robust Analysis. Journal of Monetary Economics, 52 (1), 113-157.

Chollete, L., de la Peña V., Lu, Ch.-Ch. (2012). International Diversification: An Extreme Value Approach. Journal of Banking & Finance, 36 (3), 871-885.

Christoffersen, P., Errunza, V., Jacobs, K., Langlois, H. (2012). Is the Potential for International Diversification Disappearing? A Dynamic Copula Approach, Review of Financial Studies, forthcoming.

Feldstein, M. (1981). The Effect of Inflation on the Prices of Land And Gold. NBER Working Papers, 0296.

Flood, R. P., Rose, A. K. (2010). Inflation Targeting and Business Cycle Synchronization. Journal of International Money and Finance, 29 (4), 704-727.

Goldman Sachs & Co. (1996). The Strategic Case for Using Commodities in Portfolio Diversification. Goldman Sachs Research Series on Commodities as an Asset Class, July.

Gorton, G. B., Rouwenhorst, K. G. (2005). Facts and Fantasies about Commodity Futures, Yale ICF Working Paper, 04-20.

Grubel, H. G. (1968). Internationally Diversified Portfolios: Welfare Gains and Capital Flows. The American Economic Review, 58 (5), 1299–1314.

Idzorek, T. (2006). Strategic Asset Allocation and Commodities. Ibbotson Associates. March 27.

Imbs, J. (2004). Trade, Finance, Specialization and Synchronization. Review of Economics and Statistics, 86 (3), 723-734.

Kurach, R. (2012). Stocks, Commodities and Business Cycle Fluctuations – Seeking the Diversification Benefits. Equilibrium, 7 (4), forthcoming.

Laws, J., Thompson, J. (2007). Portfolio Diversification and Commodity Futures, Liverpool Business School Working Paper, May.

Levy, H., Sarnat, M. (1970). International Diversification of Investment Portfolios. The American Economic Review, 60 (4), 668-675.

Markowitz, H. M. (1952). Portfolio Selection. The Journal of Finance, 7 (1), 77–91.

Niemczak, K. (2010). Eastern European Equity Markets and the Subprime Crisis. Does Emerging Europe Still Offer Diversification Benefits? e-Finanse, 6 (3), 47-63.

Patrick, H. T. (1972). Financial Development and Economic Growth in Underdeveloped Countries. Economic Development and Cultural Change, 20 (2), 326-329.

Rey, D. M. (2000). Time-Varying Stock Market Correlations and Correlation Breakdown, Schweizerische Gesellschaft fur Finanzmarktforschung, 4, 387–412.

Sharpe, W. F. (1963). A Simplified Model for Portfolio Analysis. Management Science, 9 (2), 277-293.

Sinquefield, R. A. (1996). Where Are the Gains from International Diversification? Financial Analysts Journal, 52 (1), 8-14.