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Global Integration of Central and Eastern European Financial Markets

The Role of Economic Sentiments

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Ansgar Belke, Joscha Beckmann, and Michael Kühl[1]

Global Integration of Central and Eastern European Financial Markets – The Role of Economic Sentiments

Abstract

This paper examines the importance of different economic sentiments, e.g. consumer moods, for the Central and Eastern European countries (CEECs) during the transition process. We first analyze the importance of economic confidence with respect to the CEECs' financial markets. Since the integration of formerly strongly-regulated markets into global markets can also lead to an increase in the dependence of the CEECs' domestic market performance on global sentiments, we also investigate the relationship between global economic sentiments and domestic income and share prices. Finally, we test whether the impact of global sentiments and stock prices on domestic variables increases proportionally with the degree of integration. We also account for effects stemming from global income. For these purposes, we apply a restricted cointegrating VAR (CVAR) framework based upon a restricted autoregressive model which allows us to distinguish between the long-run and the short-run dynamics. For the long run we find evidence supporting relationships between sentiments, income and share prices in the case of the Czech Republic. Our results for the short run suggest that economic sentiments in general are influenced by share prices but also offer some predictive power with respect to the latter. What is more, European sentiments play an important role in particular for the CEECs' share prices and income. The significance of this link increases with economic integration.

JEL Classification: E44, G15, P2

Keywords: Cointegration; European integration; financial markets; restricted autoregressive model; sentiments

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1 Ansgar Belke, University of Duisburg-Essen, DIW Berlin and IZA Bonn; Joscha Beckmann, University of Duisburg-Essen; Michael Kühl, University of Goettingen. *– We gratefully acknowledge valuable comments from three anonymous referees and from the participants of the CICM Conference "20 Years of Transition in Central and Eastern Europe: Money, Banking and Financial Markets", September 17-18, 2009, London.* *– All correspondence to Ansgar Belke, University of Duisburg-Essen, Campus Essen, Department of Economics, 45117 Essen, Germany, e-mail: ansgar.belke@uni-due.de.*

1 Introduction

With Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia 10 former communist countries joined the European Union within the last five years. Slovakia and Slovenia have already introduced the Euro in 2009 and 2007 respectively and some others are on the cusp of following them. An essential pre-condition for a successful accession to a monetary union is a successfully passed process of economic convergence (Mundell, 1961; MacKinnon, 1963). A financial market of a member country which is well integrated into the global financial market represents a key feature in this respect because it improves the stability against economic and financial vulnerability and enhances economic growth (Pagano, 1993, Schularick and Steger, 2006).

The world capital markets have become more and more integrated in the last 30 years, although some exceptions and some dispersion across countries and sectors have to be acknowledged (e.g. Bekaert and Harvey, 1995; Carrieri, Errunza and Hogan, 2007). Empirical evidence of a deeper integration of both equity and bond markets has been delivered for the Euro area (Baele and Ferrando, 2005; Beakaert; Hodrick and Zhang, 2008). Particularly just before the introduction of the Euro, the capital markets of the countries which finally entered the monetary union became more integrated, not at least due to the reduction of exchange rate volatility and the convergence of monetary policies (Fratzscher, 2002). For the Central and Eastern European countries (CEECs) a steadily enforcing integration process into global financial markets can also be observed (Chelley-Steeley, 2005, for Hungary, Poland and the Czech Republic). In these economies, the integration took place to both global and European capital markets.

When looking at capital markets, it has in the meantime become a stylized fact that asset markets are faced with over- and under-reactions of the market participants so that prices do not necessarily reflect their fundamental values. In the recent past it has been controversially discussed in finance literature that sentiments affect asset prices (Baker and Wurgler, 2005, 2007; Brown and Cliff, 2005).[1] Moreover, consumer confidence has proven to be a quite good predictor of asset prices, at least on a disaggregated level (Fisher and Statman, 2003; Lemmon and Portniaguina, 2006; Schmeling, 2009). For instance, it has been shown that consumer confidence is negatively correlated with (cumulated) asset returns in the long run.

As already mentioned, distinct progress in financial integration tends to enhance growth and offers a channel of adjustment alternative to the exchange rate. Nevertheless, non-fundamentally determined sentiments are important also in global financial markets and can

[1] In contrast to other studies Baker and Wurgler (2005) construct sentiment proxies from observed market outcomes instead of using market surveys.

therefore in principle affect prices on the domestic financial market via spillovers. If this is the case, some speak of financial contagion (Karolyi, 2003). Besides effects stemming from the domestic domain we also try to explain to which extent the domestic effects have their root in foreign influences. For policy analysis, it is important to determine the degree to which moods influence the domestic financial market performance.

The aim of our contribution is to investigate the importance of sentiments during the transition process. We pay special attention to the question whether consumer and economic confidence in Europe and the United States has an impact on stock markets and income in the CEECs since 1997. To the best of our knowledge there is no other contribution which has covered these topics before. The closest contribution to ours on the country level is the work by Jansen and Nahuis (2003) who investigated European countries over the years 1986 until 2001. However, they excluded the CEECs from their analysis. They only find a reverse causality between consumer confidence and stock prices, i.e. movements in stock prices affect consumer confidence. Their results confirm the hypothesis that moods present in the economy do not "cause" stock prices. Consequently, it appears valuable to us to assess empirically which kind of empirical pattern is valid for the CEECs.

Summing up, the literature discusses two different relationships between economic sentiment indicators and economic variables. Moreover, there is a two-directional relation among stock prices and consumer confidence. Our main aim is to model the interdependencies between sentiments, income and stock prices for the case of the CEECs. We explicitly include US and European sentiments, stock prices and income in order to analyze the effect of economic integration with respect to financial markets and moods of the CEECs. We extend the reach of the existing literature by setting up a structural framework of the economy.

In order to test for potential "causalities", we employ a macroeconomic approach based on the CAPM and the Fama-French Model. Taking this framework as a starting point, we investigate the CEEC stock markets on the country level. Our main variables are the stock market returns and the economic sentiment indicator. In our empirical analysis we apply the cointegrated VAR framework developed by Juselius and Johansen (1988, 1991) in two steps. First, we scrutinize the long-run relationships characterizing the individual CEEC economies. In a second step, the results established in the previous step enter a structural analysis framework which builds upon a restricted vector autoregressive model. The second part of our analysis relies on a macroeconomic model which we derive in chapter 3 while the results we obtain in the first step should be considered as slightly more general, a distinction which is typical for the works of Johansen and Juselius.

The first hypothesis we test is whether domestic economic confidence has an impact on financial markets of the CEECs or whether the causality is the other way round. The

integration of formerly strongly regulated markets into global markets can also lead to a dependence of CEECs' domestic market performance from *global* sentiments. Thus, our second hypothesis refers to the relationship between global confidence and the domestic economy. In the same vein, the third hypothesis to be tested empirically is whether global sentiments and stock prices affect domestic variables proportionally with respect to the degree of economic integration. For this purpose, we evaluate whether foreign sentiments can be used to assess the vulnerability of the domestic financial market with regard to the engagement of global investors. As an add-on we also check whether these sentiment indicators can be used to predict (domestic) income in the transition countries and ask whether spillover effects also stem from global share prices and global income.

The remainder of the paper is organized as follows. Chapter 2 comes up with some theoretical considerations especially with respect to the sentiment indicators which are crucial for the following analysis. Chapter 3 describes the macroeconomic framework applied. In chapter 4, we present the results of our empirical analysis which is essentially based on a restricted cointegrated vector autoregressive model (CVAR) and distinguishes between short-run and long-run dynamics as described above. Chapter 5 concludes by summarizing the results and deriving some policy implications.

2 Economic Methodology

2.1 The economy and the role of sentiments

As a first step, a clear definition of consumer confidence and investor sentiment is required. While the terms `consumer sentiments` and `investor sentiments` are sometimes used interchangeably, a careful distinction between them is indispensable. Consumer confidence and investor sentiments are not necessarily the same (Fisher and Statman, 2000). Consumer confidence or consumer sentiment indexes are collected in order to evaluate the economic situation of households. Investor sentiments are said to reflect the market perception of professional investors. From this point of view, investor sentiments might also have irrational content. Investor sentiment indicators can also be collected by surveys.

In the case of the US, consumer confidence indexes are able to predict household spending (Carroll, Fuhrer and Wilcox, 1994; Bram and Ludvigson, 1998; Howrey, 2001) and economic growth (Matsusaka and Sbordone, 1995; Howrey, 2001) with a positive correlation. A similar

relationship can also be found for European economies (Nahuis and Jansen, 2004) and the UK (Acemoglu and Scott, 1994; Easaw and Heravi, 2004).[2]

However, the corresponding channels of influence are not well established. A reasonable explanation is that consumer sentiments reflect expectations which are translated into decisions over expenditures. In contrast to the earlier results, Lemmon and Portniaguina (2006) find weak predictive power from consumer confidence indexes to economic growth with a negative correlation. They explain this negative relationship with a precautionary savings motive. An increase of consumer confidence occurs when uncertainty about the future is low, from which a reduction in (precautionary) savings follows. As a result, the present consumption increases relative to future consumption. Consumption growth in the future will accordingly be lower owing to the need to satisfy the inter-temporal budget constraint.

For the USA there are interdependencies between consumer confidence, stock returns (of small stocks) and macroeconomic activity (Lemmon and Portniaguina, 2006). Since growth also determines stock prices it is reasonable to assume that consumer sentiments have the potential also to exert an impact on stock prices. Along with the ongoing transition and growing real income per capital, households use their savings to invest in equity markets. Consequently, asset prices should react more sensitively to changes in consumer confidence. For European countries, such a negative interrelationship in the long run can also be found by using consumer confidence indexes (Schmeling, 2009).

In the short run, reverse causality can be observed for aggregated market data. Jansen and Nahuis (2005) use the consumer confidence indexes published by the European Commission for a couple of European countries (before the EU enlargement) and find that stock prices tend to Granger cause consumer confidence. Stock prices can affect the macroeconomic activity via different channels. Rising stock prices imply an increase in households' wealth. If consumption depends on wealth, the households in this case boost their consumption. Similarly to the traditional wealth effect, an indirect effect arises from consumer confidence. Stock prices reflect the discounted sum of future dividends which are related to economic activity. Thus, a rise in stock prices reflects improved future economic prospects. Hence, an increase in stock prices lets forward-looking consumers feel more optimistic. As a result, an immediate effect on macroeconomic activity takes place because households spend more money on consumption. For European countries, Jansen und Nahuis (2005) find evidence that the causality between stock prices and consumer confidence is identified by this

[2] Mehrotra and Rautava (2008) evaluate the usefulness of business sentiment indicators for forecasting developments in the Chinese real economy. Their results indicate that Chinese business sentiment indicators convey useful information about current and future developments in industrial production, retail sales and exports.

indirect channel. Along these lines, stock prices are seen as a leading indicator which accordingly affects consumer confidence.

Similarly to consumer confidence, stock prices are positively affected by investor sentiments in the short run and negatively related in the long run. An explanation for this dynamic might be that in the short run equity prices are driven by moods in the market, i.e. optimism, which lets the market value deviate from the fundamental value. In the long run, this kind of mispricing is removed, resulting in negative relationships (Brown and Cliff, 2005).[3]

Although investor sentiments and consumer sentiments are more or less disparate indicators, our considerations up to this point clearly suggest that consumer confidence shares similar dynamics with respect to stock prices. Since our aim is to investigate the extent to which the CEEC markets are subject to sentiments we feel legitimized to work with the narrower consumer confidence indexes as well as with broader economic sentiment indicators. By using the latter, the "financial situation" of households is also embedded.

2.2 The domestic economy and foreign sentiments

All the above-mentioned studies have up to now only tested for the impact of domestic sentiments. However, *foreign* sentiments also have the potential to impact on domestic market returns, which is a relevant issue with respect to the evaluation of contagion effects. The investigation of the impact of foreign sentiments on domestic assets must be related to contagion effects, especially if sentiments contain irrationality (Karolyi, 2003). Contagion stemming from sentiments in our context generally occurs when foreign sentiments *directly* affect the domestic financial market. As discussed above, both investor sentiments (Brown and Cliff, 2004) and consumer sentiments (Fisher and Statman, 2000; Schmeling, 2009) predict (cumulated) asset returns with a negative long-run correlation, due to the adjustment in response to a stock market overreaction.

With respect to contagion arguments, it is of special interest whether domestic stock prices also react to foreign forces. Such interlinkages can work via different channels. The first is a fairly direct channel. Foreign investors are engaged in the domestic capital market and redistribute their portfolios if their perception is directed to one market change. As a result, domestic asset prices are also affected. As a second and indirect effect, domestic market participants adjust their portfolios if they are faced with changes in foreign sentiments. If they realize that the economic situation abroad is changing and if they are aware that their country

[3] Burdekin and Redfern (2009) examine the importance of sentiment effects on asset allocation decisions and share prices and savings deposits in mainland China and beyond.

is linked with the foreign economy, for instance via trade flows, they will also revise their expectations regarding the future of the domestic economy.

Typically, the sentiments of the market participants of a country's major trading partners should be particularly important. A simultaneous effect arises if the trading partners report their current perceptions or when domestic market participants extrapolate the economic situation from media reporting about the foreign economic situation. With an eye on the outlined arguments, we generally expect that domestic sentiments are affected by foreign sentiments. From this point of view, the direct effect is the influence of foreign sentiments on domestic asset returns which, however, is not yet included using domestic sentiments.

3 The macroeconomic framework

3.1 The impact of macroeconomic variables on sentiments

We start with a closer inspection of the different sentiment indexes and their determinants. We explain consumer and economic confidence (sent) by national income (y) and stock prices (sp). Because domestic confidence can also depend on confidence indicators from important trading partners we also include foreign economic confidence indexes ($sent^f$). If domestic residents invest their savings globally, the performance of foreign stock price indicators (sp^f) have an impact on domestic sentiments. Consequently, the domestic sentiments can be explained as follows:

$$sent = \mu^{sent} + \theta_2^{sent} sp + \theta_3^{sent} Y + \theta_8^{sent} sent^f + \theta_{10}^{sent} sp^f . \quad (1)$$

3.2 The impact of economic confidence on stock prices

Since we are dealing with aggregated data, i.e. market portfolios, we need an economic model that is able to explain market returns. Following the capital asset pricing model (CAPM), asset returns can be explained by the riskless interest rate and the market return weighted by the individual risk of the asset (covariation of asset returns with market returns per unit market risk). Alternatively, the arbitrage pricing theory (APT) decomposes the return of an asset into the expected return of this asset and several factors which are related to firm specifics or market factors.

Fama and French (1993) filter out five common factors which very well explain individual asset and bond returns. Our aim is to look at the country level, i.e. we are interested in the market aggregates. Solnik (1974) introduces the international asset pricing theory (IAPM) in order to explain the returns of a country's market portfolio. The IAPM explains the expected (real) return of the domestic market portfolio by the risk-free (world) interest rate,

the market risk premium which is equal to the difference between the expected world portfolio return and the risk-free world interest rate, and risk premia on all currencies with which the country is trading. In order to work with a tractable model for the empirical analysis we simplify the model significantly and construct a factor model which can be seen as an international variant of the Fama and French (1993) model.[4]

We explain the expected market return, in nominal terms, by the macroeconomic variables. As a proxy of riskless borrowing we use the domestic short-term interest rate (i). Since we look at nominal returns we also include the rate of inflation (π). Furthermore, national income can help to explain the evolution of stock prices. Following the IAPM, we take into account the volatility of the nominal effective exchange rate ($vola^{fx}$) as a proxy for risk premia stemming from exchange rate uncertainty. Exchange rate uncertainty is predominantly a concern for an international investor. The growing importance of pricing the domestic exchange rate risk is therefore implicitly an indication of international market integration. Moreover, domestic stock prices can also depend on foreign stock prices because of contagion effects in globally integrated markets. International linkages among stock prices can also emerge because of the international business cycle. In order to catch such effects we include foreign income (Y^f) into our stock market equation. Based upon the arguments outlined above, domestic sentiments have the potential to affect stock prices. But since we are also interested in contagion stemming from foreign sources, we also integrate foreign sentiments. An interesting question, then, is whether we are able to detect and trace some major and systematic changes in the effect of European or US variables during the transition process. The corresponding model representation is:

$$sp = \mu^{sp} + \theta_1^{sp} sent + \theta_3^{sp} Y + \theta_5^{sp} \pi + \theta_6^{sp} i + \theta_8^{sp} sent^f + \theta_{10}^{sp} sp^f + \theta_{12}^{sp} Y^f + \lambda_1 vola^{fx}. \quad (2)$$

3.3 Structure of the macroeconomy

Usually, analyses of economic confidence are enacted within the framework of vector autoregressive models or vector error-correction models, depending on the specific research interest. If the latter is more on the linkage between economic confidence and stock prices, these two indicators and, in some cases, additional explanatory variables are included. Accordingly, if the link between confidence indicators and consumption (i.e. growth) is investigated, these two indicators and further control variables are taken into account. However, the structure of the economy is not usually modelled in this strand of literature. Hence, in this paper, we make an additional contribution to the literature. We explore the

[4] Strictly speaking, the Fama-French model is a three-factor model. From this point of view, our approach is multi-factor model.

linkages between economic confidence, stock prices and national income by accounting for contagion effects within a structural model guided by important economic relationships.

Based upon a simple Phillips curve relationship, the rate of inflation depends on the money supply (M). In addition, we allow for the side effects of demand on prices. Since stock prices increase wealth and wealth is linked to consumption, increases in domestic stock prices tend to raise domestic inflation:

$$\pi = \mu^{\pi} + \theta_2^{\pi} sp + \theta_3^{\pi} Y + \theta_4^{\pi} M. \quad (3)$$

Inflation also raises interest rates because market participants need a compensation for a loss in purchasing power. An increase in income stimulates liquidity demand and therefore contributes to a rise in the interest rate. Through the supply side, a monetary expansion lowers interest rates. Stock prices also impact interest rates via some substitution effects. Thus, the interest rate equation boils down to:

$$i = \mu^{i} + \theta_2^{i} sp + \theta_3^{i} Y + \theta_4^{i} M + \theta_5^{i} \pi. \quad (4)$$

What is more, money supply (equation (5)) depends on real income, the inflation rate stock prices and interest rates. To close the model, changes in monetary policy are reflected in changes in the money supply. Against this background, the effects of monetary policy on interest rates can be found in equation (4), whereas the direct effects on money supply are given by:

$$M = \mu^{M} + \theta_2^{M} sp + \theta_3^{M} Y + \theta_5^{M} \pi + \theta_6^{M} i. \quad (5)$$

In order to be able to test for an effect of sentiments on income we explain income with the confidence index, stock prices and money supply. In addition, we account for international linkages in income developments (Y^f):

$$Y = \mu^{Y} + \theta_1^{Y} sent + \theta_2^{Y} sp + \theta_4^{Y} M + \theta_8^{Y} sent^f + \theta_{10}^{Y} sp^f + \theta_{12}^{Y} Y^f \ . \quad (6)$$

In such a framework, we are able to discriminate between sentiments and stock prices as leading indicators. For sentiments and stock prices we also draw on foreign variables because stock prices could affect income, for instance via a wealth effect. Foreign sentiments also have an impact on domestic income because of their leading indicator property abroad. If they are able to forecast foreign consumption, they should also have the potential to predict domestic income via an export channel. Via the trade channel domestic income can also be directly affected by foreign real income. Again, our interest in this context is to investigate whether the importance of US and, in particular, of European sentiments steadily increases during the transition process.

4 Empirical analysis

4.1 Data

Let us now turn to our data choice. As a proxy of consumer confidence for European countries we employ the Economic Sentiment Indicator (ESI) as published by the European Commission. We adhere to two different indicators, one sub-indicator which is directly linked to consumer confidence and another representing an aggregate based on various sentiment indicators. In the following, we denote the former as "consumer sentiments" and call the latter "economic sentiments". Both indicators are based upon harmonised surveys across the countries of the European Union (EU). The economic sentiment indicator consists of surveys addressed to representatives of the industry sector (manufacturing) and the services, retail and construction sectors and consumers, while the consumer sentiment indicator only refers to consumers. The countries under investigation are the Czech Republic, Poland, Hungary and Slovakia. Unfortunately, consumer confidence data are not available for Poland and Slovakia for the whole of the estimation period. Hence, we confine ourselves to the use only of economic sentiments in the case of both these countries. In order to capture influences from the outside of the European Union we also rely on sentiments originating from the US as the world's leading economy. On the whole, then, we are able to estimate an array of six models based on monthly data and a sample period starting from January 1997 and ending in December 2008.

In the United States, two important sentiment indexes are commonly used in scientific research. The first is Michigan's Consumer Confidence Index (MCCI), the second is the Conference Board's Consumer Index (CBCCI). While the MCCI comprises long-term changes and long-term expectations, the CBCCI predominantly focuses on the current situation (Bram and Ludvigson, 1998; Ludvigson, 2004). Although both indexes have predictive power for expenditures in the same direction, the CBCCI is said to have more explanatory power. When we examine economic sentiments we draw on the CBCCI, and for consumer confidence we use the MCCI.

All remaining data have been taken from the OECD and International Financial statistics. As interest rates (i) we use short-term interbank interest rates with a maturity of 3 months. Real income (y) is proxied by the production index as provided by the IMF. To match the money supply (M) we use the broad money aggregate M3. However, for Hungary and Slovakia no adequate time series of money supply are available. Consequently, we exclude this variable from the corresponding models. We employ the leading composite indexes of each country as provided by the IMF as a proxy of share prices (sp). In addition, we use the consumer price index in order to reflect price developments and to calculate the rate of

inflation (π). Finally, we apply a GARCH (1,1) model to capture the volatility ($vola^{fx}$) of the nominal effective exchange rate. As usual, all variables except interest rates and sentiment indicators are expressed as natural logarithms. Let us now turn to our long-run analysis.

4.2 Long-run analysis: econometric methodology and results

If variables are non-stationary owing to unit roots, a distinction should be made between long-run and short-run dynamics. While non-stationary time series can be tied in the long run, sharing common stochastic trends, a short-run dynamic can be different. For this reason, both dynamics should be accounted for. For the long-run analysis of non-stationary data the concept of cointegration is used, which refers to linear combinations of the variables that result in stationary long-run relationships between them. There are different ways to test for cointegration among a couple of variables. In the following, we apply the multivariate test of Johansen (1988), which draws upon the following vector autoregression representation (VAR):

$$\Delta X_t = \Pi X_{t-1} + \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{k-1} \Delta X_{t-k-1} + \Phi D_t + \epsilon_t, \quad t = 1, \dots, T. \tag{7}$$

The non-stationary behavior is accounted for by a reduced rank ($r < p$) restriction of the long-run level matrices Π which can be fragmented into two $r \times p$ matrices α and β' ($\Pi = \alpha\beta'$). β' gives the coefficients of the variables for the r long-run relation while α contains the adjustment coefficients describing the reaction of each variable to disequilibria from the r long run relations given by the $r \times 1$ vector $\beta' X_{t-1}$. The deterministic components are given by the ($p \times 1$) vector ΦD_t while ϵ_t describes an independent and identically distributed error term. The expression ΦD_t also includes the constant term μ. The term $\Gamma_1 \Delta X_{t-1}$ describes the short-run dynamics of the model using p equations between current variables, lagged variables and equilibrium errors (Juselius, 2006).

In the following, we run a cointegration analysis for each country in order to identify the long-run structure of the corresponding domestic economy. The idea behind the approach is that we would like to model long-run relationships of domestic variables. In doing so, we neglect foreign variables. The reason is that we would need to model explicitly the whole structure for the model including both domestic and foreign variables. Since we are using two foreign domains, namely the USA and the EMU, our system would comprise 12 variables for the Czech Republic and Poland and 11 variables for Hungary and Slovakia, respectively. Long-run relationships can be manifold in such a setting, such that the economic identification

of the system turns out to be rather sophisticated. For this reason, we rely on domestic variables concerning the long-run analysis.

For the long-run analysis, we therefore include all domestic macroeconomic variables outlined in equations (1)-(6) for all the countries in our analysis. As mentioned above, there are no consumer confidence data available for Poland (PL) and Slovakia (SK) for the whole period. Hence, we confine ourselves to one specific setting containing economic sentiments for both countries, while we estimate two configurations using both consumer and economic sentiments for Hungary and the Czech Republic. We also omit money supply for Hungary and Slovakia from our analysis for the reason of data availability.

We start our empirical investigation with some preliminary unit root tests applying the Phillips-Perron, the KPSS and the DF-GLS tests. The results, which are available upon request, suggest that all series should be considered as integrated of order one (I(1)).[5] In Tables 1 and 2 we present the results of our cointegration analysis in detail for the Czech Republic. To save space, we decided to display the results for the other countries in Tables A1 to A4 in the Appendix. In these cases the corresponding sentiment indicators do not enter the established long-run relations, which are described in detail below. For the specification of the model the choice of the lag is based on the presented tests for autocorrelation and ARCH-effects. As a reaction to the high skewness and kurtosis of some variables, especially the consumer price index, we include dummies in some cases. According to Rahbek et al. (2002), the results we gain in the following are still robust in spite of the ARCH-effects that remain in some cases.

One of the most crucial steps in our analysis is the determination of the rank, that is, the number of stationary long-run relationships. To identify the number of cointegrating relations r we rely on the trace test developed by Johansen (1988).[6] For all countries we find at least one long-run relationship. With the results of Slovakia and Poland at hand, we get basic results which are difficult to interpret. As a consequence, we decide to consult the recursive graphs of the trace statistic and inspect the unit roots of the companion matrixes (not reported) as suggested by Juselius (2006). Based upon these results we only implement one cointegrating relation for Poland (Table A2 in the Appendix) and three relations for Slovakia (Table A1 in the Appendix). For the Czech Republic (Tables 1 and 2) and Hungary and (Tables A3 and A4 in the Appendix) we work with a rank of two.

[5] We also tested for unit roots in the differences in oder to make sure that none of the variables is integrated of oder two (I(2)).

[6] The test statistic of the corresponding likelihood test, the so called trace test, is given by $trace(r) = -T \sum_{i=r+1}^{p} \log(1 - \hat{\lambda}_i)$. with λ as the eigenvalues.

After determining the rank, the Johansen approach provides us with the maximum likelihood estimates of the unrestricted cointegrating relations $\beta' X_{t-1}$. In cases of a rank larger than one it is necessary to impose identifying restrictions on β in order to achieve interpretable economic relationships for the long-run structure; otherwise the cointegration vector is not unique. As a guidance for the implied restrictions we rely partly on tests for parameter exclusion from the cointegration space. Based on those results and some theoretical considerations, we identify the long-run structure by testing for different hypotheses. For each case, the p-value of the corresponding LR-test indicates that the imposed restrictions are not rejected.

- Tables 1 to 2 about here -

For the Czech Republic, the sentiment indicators are important for the long run in both configurations. Using economic sentiments (Table 1), zero restrictions have been implied on income, sentiments, share prices and interest rates (first relation) and CPI, share prices and money supply (second relation). The second relation expresses a positive relation between sentiments and income while the first relation suggests a long-run proportionality between the monetary aggregate and the CPI. In addition, the interest rate enters the second cointegration vector and is positively related to the income variable. For the setting including the consumer sentiments (Table 2) the first cointegrating relation suggests that consumer sentiments and share prices are negatively correlated in the long run with both positively related to CPI and all other variables restricted to zero. This pattern is consistent with the view that the engagement of noise traders with correlated sentiments in asset markets has the clear potential to lead to mispricing for a couple of periods. For the second relation, share prices and interest rates are restricted to zero. The findings also correspond to theoretical suggestions with, on the one hand, money supply and consumer prices being positively related, and a positive relationship prevailing between consumer confidence and income. The latter case is consistent with the view that consumer confidence indexes offer predictive power for real income (Howrey, 2001).

For of Hungary (Tables A3 and A4) and Poland (Table A2) economic sentiment indicators do not enter any long-run relationship. In the case of Slovakia the economic sentiments are considered as stationary around a constant, implying that they are also not related to other variables (Table A1). For all three countries CPI, real income, stock prices and interest rates enter the long-run relations.[7] Except for the case of Slovakia, real income is

[7] Zero restrictions have been applied as follows: at first, sentiments are restricted to zero for each relation except for the first relation of Slovakia, where all other variables are restricted to zero. With respect to the other relations for Slovakia, CPI and interest rates are also restricted to zero in the second relation, while income does not enter the third relation. For Poland the money supply is restricted to zero. For Hungary share prices and interest rates do not enter the first relation, while the same is true for income with respect to the second relation.

positive related to price developments. For Poland and Slovakia the results suggests that share prices and income are positively linked in the long run. The results for Hungary are qualitatively identical for both settings. The results for the second relation in both cases accord to the third relation for Slovakia with CPI positively correlated to stock prices and negatively related to interest rates. All these results are mostly in line with theoretical considerations as outlined in Section 3.

To sum up our results gained so far: we are able to identify a long-run structure for each model. The domestic sentiment indicators of Poland, Hungary and Slovakia seem to have no empirical relevance for the long-run structure, given the implied restrictions. Only for the Czech Republic can a long-run influence stemming from sentiments be observed.

4.3 Modelling the short-run structure using Feasible Least Squares

After identifying the long-run structure for domestic economies, we apply a structural analysis framework which also takes foreign variables into account. The framework is built on a restricted autoregressive model in which the domestic long-run relationships are explicitly considered by the inclusion of error-correction terms. For this reason, we draw upon equations (1) to (6) and use the (stationary) first differences of the respective variables. In doing so, we set up an economic structure by which we explicitly allow for endogeneities. The intention of this analysis is to gain insights into short-run causalities between the variables. In particular, we are interested in the role of US and European factors, in particular sentiments, for the transition economies. Basically, our analysis refers to the following model:

$$\Delta X_t = \alpha \begin{pmatrix} \beta' X_{t-1}^0 \\ \delta' X_{t-1}^1 \end{pmatrix} + \Theta \Delta X_{t-1} + \Lambda Z_{t-1} + \mu + \varepsilon_t. \qquad (8)$$

The vector X contains endogenous variables whereas the vector Z comprises exogenously treated variables. In combination with Λ, the restricted coefficient matrix Θ introduces the structure outlined in equation (1) to (6) as described in section 3 by restricting the lags on the right-hand side of the corresponding variables in the VAR to zero. The matrix Θ can then be written as:

$$\Theta = (\Theta^1 : \Theta^2) \qquad (9)$$

with

$$\Theta^1 = \begin{pmatrix} \theta_1^{sent} & \theta_2^{sent} & \theta_3^{sent} & 0 & 0 & 0 & 0 \\ 0 & \theta_2^{sp} & \theta_3^{sp} & 0 & \theta_5^{sp} & 0 & 0 \\ \theta_1^{y} & \theta_2^{y} & \theta_3^{y} & 0 & \theta_5^{y} & 0 & 0 \\ 0 & \theta_2^{M} & \theta_3^{M} & \theta_4^{M} & \theta_5^{M} & \theta_6^{M} & 0 \\ 0 & \theta_2^{\pi} & \theta_3^{\pi} & \theta_4^{\pi} & \theta_5^{\pi} & 0 & 0 \\ 0 & \theta_2^{i} & \theta_3^{i} & \theta_4^{i} & \theta_5^{i} & \theta_6^{i} & 0 \\ 0 & \theta_2^{s} & 0 & 0 & \theta_5^{s} & \theta_6^{s} & \theta_7^{s} \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix} \tag{9a}$$

and

$$\Theta^2 = \begin{pmatrix} \theta_8^{sent} & \theta_9^{sent} & \theta_{10}^{sent} & \theta_{11}^{sent} & 0 & 0 \\ \theta_8^{sp} & \theta_9^{sp} & \theta_{10}^{sp} & \theta_{11}^{sp} & 0 & 0 \\ \theta_8^{y} & \theta_9^{y} & \theta_{10}^{y} & \theta_{11}^{y} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ \theta_8^{sentUS} & 0 & \theta_{10}^{sentUS} & 0 & \theta_{12}^{sentUS} & 0 \\ 0 & \theta_9^{sentEMU} & 0 & \theta_{11}^{sentEMU} & 0 & \theta_{13}^{sentEMU} \\ 0 & 0 & \theta_{10}^{spUS} & \theta_{11}^{spUS} & \theta_{12}^{spUS} & \theta_{13}^{spUS} \\ 0 & 0 & \theta_{10}^{spEMU} & \theta_{11}^{spEMU} & \theta_{12}^{spEMU} & \theta_{13}^{spEMU} \\ \theta_8^{YUS} & \theta_9^{YUS} & \theta_{10}^{YUS} & \theta_{11}^{YUS} & \theta_{12}^{YUS} & \theta_{13}^{YUS} \\ \theta_8^{YEMU} & \theta_9^{YEMU} & \theta_{10}^{YEMU} & \theta_{11}^{YEMU} & \theta_{12}^{YEMU} & \theta_{13}^{YEMU} \end{pmatrix}. \tag{9b}$$

The vector X can be partitioned into two sub-vectors X^0 and X^1, with X^0 containing domestic and X^1 foreign endogenous variables. Concerning the adjustment process, the matrix α can be partitioned into an $(r \times n)$ matrix α^0 and an $(r \times m)$ matrix α^1. α^0 represents the adjustment to the established long-run relations and consequently has the same dimension as β, while α^1 has the same dimension as δ. Both α^1 and δ are null matrices. From this follows that only domestic variables adjust towards domestic long-run equilibria.

Compared to the equations in Section 3, we include three more θ coefficients per foreign variable as we distinguish between two foreign countries with respect to foreign variables. In order to test for contagion effects and to account for effects stemming from the EMU or US variables during the transition process, X^1 contains sentiments, real income and share prices of the United States and the EMU.

$$X^0 = (sent \quad sp \quad y \quad M \quad \pi \quad i \quad s)' \tag{10}$$

$$X^1 = (sent^{US} \quad sent^{EMU} \quad sp^{US} \quad sp^{EMU} \quad Y^{US} \quad Y^{EMU})' \tag{11}$$

$$X \quad = (X^0 \vdots X^1) \tag{12}$$

Consequently, the variables included in X^1 do not enter the cointegration relationship and do not adjust toward any long-run relationship. From the perspective of cointegration analysis, they are exogenous. The Θ matrix shows that the variables contained in X^1 directly affect only the variables considered in X^0. However, we allow for correlated error processes in order to preserve endogeneity. Consequently, the errors ϵ_t are normally distributed with zero mean and a variance-covariance matrix of $\sigma^2\Omega$ which captures the correlation structure. Thus we employ a VAR structure with restricted coefficients which we estimate with feasible generalized least squares. De facto, we adopt a seemingly unrelated regression approach in which one-period lagged variables enter the right-hand side exclusively.[8] We additionally include the error-correction term. Applying this methodology, we are able to distinguish between the short- and the long-run dynamics. [9]

The vector of exogenous variables Z consists only of the volatility of the nominal effective exchange rate. Since it is important only for the domestic stock price equation, the coefficients for all other equations are restricted to zero:

$$Z = (vola^{fx})' \tag{13}$$

We start our analysis by estimating each system for the whole period.[10] To shed some further light on the effects of the progressing economic integration we proceed by splitting the sample and re-estimating from January 1997 to December 2003 and from January 2004 to December 2008 respectively. The idea behind this procedure is that the economic integration of the countries under observation has been developed much more over the second period, i.e. after the accession to the European Union. Thus it is of economic importance whether the effects stemming from global economies tend to be much higher in the second sample, i.e. after the formal integration process into the EU. An enhanced integration process is to be

[8] In each case we start our analysis by determining the lag order according to the Akaike information criterion (AIC) based upon the unrestricted model. As a lag of one seems to be an adequate choice for most models we decided to use exactly this configuration for each model in order to achieve comparable results.

[9] In addition, we explain the nominal effective exchange rate by domestic interest rates, domestic share prices and rates of inflation. However, the exchange rate is not an explanatory variable for the other equations. Linkages with the foreign exchange market only arise by the latently correlated error processes, such that shocks to the foreign exchange market are linked with shocks on other markets. Furthermore, we allow for endogeneities among the foreign variables. Except for sentiments, the US factors can have an impact on EMU variables and vice versa. The foreign sentiments are predominantly explained by foreign variables of the corresponding countries. Linkages with other markets are only allowed by correlated errors. In order to allow for a high order of flexibility we also include both foreign sentiments in the foreign income equations. Influences of domestic variables on foreign factors can only occur via the variance-covariance-matrix of the residuals.

[10] Preliminary estimation results suggested that the annual change of the CPI should still be considered as integrated of order. We therefore decided to work with the change in the annual inflation rates which actually implies a slight modification of the vector error-correction models estimated before.

considered if either the significance of foreign variables occurs only in the second period or the estimated coefficient has increased in this period.

Sample 1997-2008

We now provide a description of the empirical results for the full sample.[11] Tables 3 and 6 present the results for the explanation of the sentiments. The regressions for stock prices as the left-hand side variable are given in Tables 4 and 7. The results for income as the left-hand side variable are given in Tables 5 and 8. In each model the error term resulting from our domestic long-run analysis is denoted with ect and turns out to be significant in many cases. When interpreting our results, we predominantly draw on the equation of the sentiments, income and stock prices. Since the other model equations are considered as acting as control variables we do not explain the results in more detail.

- Tables 3 to 8 about here -

We start with a discussion of our estimation results for the sentiment indicator(s) for the whole sample. Our results turn out to be different for economic sentiments and consumer sentiments. The suggested theoretical factors offer less explanatory power for the consumer sentiments of the Czech Republic (Table 3) and Hungary (Table 6). The only influence on consumer sentiments occurring in the Czech Republic stems from the second established long-run relation. For Hungarian consumer confidence, no respective coefficient proves to be significant (Table 6). Using economic sentiments instead, we obtain the striking result that European economic sentiments affect domestic sentiments positively in the case of each country, with ${\theta_8}^{sent}$ in equation (1) throughout gaining significance at the 1% level (Table 3 and Table 6). In contrast, the lagged domestic sentiments enter with a negative sign for each case except Slovakia, where the corresponding parameter is insignificant (Table 6). We thus feel legitimized to conclude that important spillover effects from European sentiments on domestic sentiments exist over the full sample.

Our empirical evidence of "causality" running from share prices to economic sentiments turns out to be rather mixed. While "causality" in this direction does not occur in the cases of Slovakia (Table 6), positive changes in domestic share prices result in a rise in the economic sentiment indicators for the Czech Republic (Table 3) and Hungary (Table 6). Additionally, the Czech economic sentiments are negatively related to European stock prices (Table 3).[12]

[11] Since we are predominantly interested in the explanation of sentiments, income and stock prices, we do not report the results of the respective lines 4 to 10 in equation (9). However, they are available upon request.

[12] Analogously, Jansen and Nahuis (2002) find that stock returns and changes in sentiment are positively correlated for nine countries, with Germany being the main exception due to the inclusion of atypical "years".

As a next step, we try to explain changes in the share prices with reference to equation (2). Here our results clearly suggest that sentiment indicators only rarely have a significant influence on share prices in the short run. Inspecting Tables 4 and 7, we find no evidence in favour of any causality running from domestic sentiments to share price. On the contrary, global sentiments have an impact on share prices. The negative impact of European consumer and economic sentiments on Czech share prices is significant at least at the 10% significance level (Table 4). Obviously, an increase in European sentiments initiates a redistribution of wealth away from domestic assets. Moreover, Polish and Hungarian share prices are positively influenced by US economic sentiments and US consumer sentiments respectively (Table 4 and Table 7). Turning to other factors besides sentiments, we find a negative influence of short-term interest rates on share prices for each country (Table 4 and Table 7). This effect is in line with theory, since a rise in the short-term interest rate corresponds to a higher discount factor and consequently reduces share prices. The coefficient with respect to exchange rate volatility turns out not to be significant for each country. Interestingly, there seem to be more contagion effects, since Polish share prices are positively influenced by European share prices while a negative effect stems from US share prices. In addition, they turn out to be positively related to US income (Table 4). Summing up the results up to this point, we conclude that there is no clear pattern concerning the causality from sentiments to share prices, although some effects from foreign sentiments on domestic share prices can be observed.

Analyzing the determinants of income, we again achieve strong empirical support in favour of the hypothesis of inter-linkages running from the Euro area to the transition countries. For Slovakia, Poland and Hungary, European economic sentiments have a positive impact on income, while the same is true for the impact of European consumer sentiments in the case of the Czech Republic (Table 5 and Table 8). Conversely, we only find evidence for a link running from domestic economic sentiments to income in the case of the Czech Republic (Table 5). Consequently, the expectations reflected by European sentiments seem to influence income in the transition economies mainly through an indirect trade channel (a direct trade channel would be established by an effect via foreign real income). Our results also suggest that US sentiments affect Hungarian and Czech income negatively, as suggested by the precautionary saving motive described in Section 2.1 (Table 5 and Table 8). Probably because of the international business cycle, US income affects Hungarian income positively (Table 5).

For the remaining variables described in Section 3.3, the results of our estimations reflect theoretical considerations and the results of our long-run analysis. As the detailed results do not refer to the main investigation topic but instead serve as a proof for the general adequacy of our framework, we do not explain them in detail. However, they are available upon request.

Sub-samples 1997-2003 and 2004-2008

A comparison of the results for the two subsamples (1997 to 2004 and 2004 to 2008) enables us to answer the question of whether *global* factors affect the economies of the CEECs to a higher degree with ongoing integration. We decided to include the error term in both sub-samples, as the cointegrating relationship should exist permanently across the whole sample, whereas the adjustment coefficient does not necessarily become significant in some cases. Overall, our results suggest that the significant effects stemming from global factors have occurred more predominantly in the second sample than during the first period. For an effect of global sentiments on domestic variables we can consider the following results: European economic sentiments influence Czech and Polish share prices in the second but not in the first sample (Table 4). However, increasing effects stemming from US sentiments on domestic share prices cannot be observed except in the case of consumer sentiments in Hungary (Table 7). Regarding an effect of global sentiments on domestic sentiments and domestic income no clear pattern can be addressed to the transition process.

Let us now cast an eye on the influence of US and European stock prices on domestic factors. In this case we find a significant impact of European stock prices on Hungarian stock prices in the case of both consumer and economic sentiments for the second sub-sample, while we do not detect any significant effects for the first sub-sample (Table 7). An identical effect can be observed for the Czech Republic and the case of consumer sentiments (Table 4). On the contrary, we find only an effect of European stock prices on Polish stock prices in the first period (Table 4). In addition, there are influences from European stock prices on Czech consumer sentiments and an effect of US stock prices on Hungarian consumer sentiments and Slovakian economic sentiments only for the second sample (Tables 3 and 6).

The impact of income from Europe and the US is also clearly stronger for the second period. For Poland, Slovakia and Hungary, an impact of US income on domestic share prices can only be observed for the second period, while an influence on Czech share prices arises for both periods (Table 4 and 7). Surprisingly, in the Czech case the sign is negative in the first period while it is positive in the second. European income also affects Czech share prices and Hungarian income only during the second sample (Table 4 and 8).

Obviously, the ongoing integration process results in a stronger business cycle synchronization. Altogether, some of the observed direct impacts on domestic income stemming from global sentiments over the whole sample seem to result from or coincide with an increasing importance of global income which might be interpreted as an indicator of an evolving real convergence process. The different signs with respect to the causality between stock prices and sentiments are consistent with the theoretical suggestions developed in

Chapter 2.1. Furthermore, Jansen and Nahuis (2003) also report different signs with respect to the link running from sentiments to stock prices.

Summing up the results from our sample split, an increasing importance of global factors in the second period, particularly of sentiments on stock prices, can be observed. Consequently, we see evidence that the domestic markets of the CEEC, particularly the financial markets, become more integrated because more global links occur.

5. Conclusions

While some major conclusions can be drawn from our analysis, there are also still some puzzles to be solved. One of them certainly concerns the choice of an adequate sentiment indicator. Our major results hold for both economic and consumer sentiments. Nevertheless, some differences with respect to, for instance, number and kind of explaining variables or their impact on other variables remain in the cases of Hungary and the Czech Republic, where our analysis is based, on both indicators. However, economic sentiments have a higher impact than consumer sentiments since global sentiments contain more explanatory power in these cases. With respect to the importance of sentiments for financial markets in the CEECs, our results suggest that for the short run there are in some cases indeed strong linkages from global sentiments to domestic share prices. Furthermore, we also find evidence for an "inverse" long-run relationship between stock prices and domestic consumer confidence in the case of the Czech Republic.

However, the most striking result is the clear-cut evidence of a *strong influence of European sentiments on moods and income in the CEECs*. Our results for the short run even suggest that the explanatory power of global sentiments appears to be higher than the influence of domestic sentiments. The same seems to be true of the impact of the global stock markets. This pattern is intuitively plausible in view of the sheer size of the global stock and goods markets compared with the domestic markets. From an economic point of view, the question of the main channels of influence arises. Considering the fact that global sentiments even affect income in the CEECs in cases where there is no influence of domestic sentiments of these countries, a principle impact seems to arise from global linkages established by the transition process and the integration of the CEECs into the world economy. Furthermore, contagion effects through economic confidence and stock prices should also play an important role.

We are also able to show that global sentiments and stock prices affect domestic variables to a higher degree when the domestic economies have undergone a significant degree of integration with global markets. This implies that the economic integration of transition

countries goes hand in hand with cumulative spillover effects via changes in share prices and sentiments stemming from the European Union and the United States. Global sentiments and share prices therefore play an important role in ongoing financial market integration, which in turn is a condition for real convergence. With respect to the latter, our results suggest that global income plays an increasing role concerning income and share prices in the transition economies.

An interesting question is what implications arise if domestic sentiments are stabilized through monetary or fiscal policy because of potential EMU membership. This might imply that some of the observed relationships will not be found in future, although sentiments will play an important role. We also leave the task of putting under observation the different results between the countries to further research.

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Tables

Table 1: Cointegration analysis for the Czech Republic (economic sentiments)

Panel (a): I (1)-Analysis (Rank Test)

p-r	R	Eig. Value	Trace	Trace*	Frac95	P-Value
6	0	0.411	171.122	144.588	103.679	0.000
5	1	0.282	96.379	74.883	76.813	0.001
4	2	0.154	49.705	23.495	53.945	0.116
3	3	0.104	26.188	11.026	35.07	0.336
2	4	0.064	10.712	5.334	20.164	0.577
1	5	0.01	1.373	0.832	9.142	0.883

Panel (b): Cointegration vectors

	$sent$	cpi	y	M	sp	i	μ
Beta(1)		1.000		-0.531			-1.635
				(-25.393)***			(-8.456)***
Beta(2)	-0.011***		1.000			-0.019***	1.321***
	(-5.372)					(-3.610)	(2.340)

Panel (c): Test of restricted model

CHISQR(5) = 5.399 [0.369]

Panel (d): Adjustment coefficients

	$\Delta sent$	Δcpi	Δy	ΔM	Δsp	Δi
Alpha(1)	2.07	-0.067***	-0.253***	0.012	0.075	-5.007***
	(0.198)	(-3.697)	(-3.263)	(0.498)	(0.391)	(-5.054)
Alpha(2)	0.44	-0.015***	-0.055***	0.004	0.017	-1.119***
	(0.190)	(-3.631)	(-3.195)	(0.787)	(0.400)	(-5.095)

Panel (e): Test of weak exogeneity

r	DGF	5% C.V.	$sent$	cpi	y	M	sp	i
1	1	3.841	0.139	0.853	1.211	6.151	0.035	0.393
			[0.710]	[0.356]	[0.271]	[0.013]	[0.852]	[0.530]
2	2	5.991	0.215	15.687	10.788	45.068	0.130	24.230
			[0.898]	[0.000]	[0.005]	[0.000]	[0.937]	[0.000]

Panel (f): Test of exclusion

r	DGF	5% C.V.	$sent$	cpi	y	M	sp	i	μ
1	1	3.841	0.014	0.326	0.200	0.702	3.037	0.243	0.000
			[0.905]	[0.568]	[0.654]	[0.402]	[0.081]	[0.622]	[0.999]
2	2	5.991	17.008	23.317	3.417	20.998	3.185	4.674	7.733
			[0.000]	[0.000]	[0.181]	[0.000]	[0.203]	[0.097]	[0.029]

Panel (g): Tests for autocorrelation				Test for Arch			
LM (1):	ChiSqr(25)	= 23.406	[0.554]	LM (1):	ChiSqr(225)	= 261.938	[0.046]
LM (2):	ChiSqr(25)	= 21.014	[0.692]	LM (2):	ChiSqr(450)	= 497.853	[0.059]
LM (3):	ChiSqr(25)	= 28.826	[0.271]	LM (3):	ChiSqr(675)	= 706.190	[0.196]
LM (4):	ChiSqr(25)	= 28.376	[0.291]	LM (4):	ChiSqr(900)	= 924.550	[0.278]

Note: Panel (a) reports Johansen (1988, 1991) cointegration tests. r denotes the cointegration rank. Panel (b) shows the estimates of the cointegration vector. Panel (c) reports the test for over-identifying restrictions which is an LR-test. Panel (d) reports the adjustment coefficients towards the long-run equilibrium. Panel (e) tests for weak exogeneity of the variables, i.e. whether they participate in the adjustment process. Panel (e) reports test on variable exclusion, i.e. whether the variable enters the cointegration vector. Panel (e) and Panel (f) are LR-tests where the tests statistics are distributed as X^2 with r degree of freedom. DGF denotes degree of freedoms. P-values are in brackets and t-statistics in parentheses. Panel (g) reports tests on autocorrelation and on heteroskedacticity. Both tests are LR-test which are distributed as X^2 with degrees of freedom in parentheses. * rejection of the null hypothesis at the 10% significance level. ** rejection of the null hypothesis at the 5% significance level. *** rejection of the null hypothesis at the 1% significance level. $sent$ denotes sentiments, cpi consumer price index, y real income, M money stock, sp stock prices and i short-term interest rates. μ is a constant term.

Table 2: Cointegration analysis for the Czech Republic (consumer confidence)

Panel (a): I (1)-Analysis (Rank Test)

p-r	r	Eig.Value	Trace	Trace*	Frac95	P-Value
6	0	0.399	179.750	163.336	103.679	0.000
5	1	0.345	107.382	50.860	76.813	0.000
4	2	0.126	47.342	20.983	53.945	0.175
3	3	0.1	28.287	12.131	35.07	0.231
2	4	0.079	13.316	12.363	20.164	0.347
1	5	0.012	1.659	1.362	9.142	0.835

Panel (b): Cointegration vectors

	$sent$	cpi	y	M	sp	i	μ
Beta(1)	-0.003***	1			-0.125***		-4.259***
	(-2.531)				(-3.123)		(-17.001)
Beta(2)	-0.007***	6.01***	1	-2.58***			-12.122***
	(-3.628)	(8.712)		(-9.121)			(-9.4221)

Panel (c): Test of restricted model

CHISQR(1) = 0.196 [0.658]

Panel (d): Adjustment coefficients

	$\Delta sent$	Δcpi	Δy	ΔM	Δsp	Δi
Alpha(1)	-6.578**	-0.001	0.057**	-0.043***	0.059	0.013
	(-2.012)	(-0.142)	(2.011)	(-5.317)	(0.921)	(0.897)
Alpha(2)	11.325***	-0.008	-0.08***	0.015**	-0.138**	0.038**
	(3.939)	(-1.327)	(-3.256)	(2.056)	(-2.212)	(1.815)

Panel (e): Test of weak exogeneity

r	DGF	5% C.V.	$sent$	cpi	y	M	sp	i
1	1	3.841	0.025	1.404	1.642	12.121	0.359	1.094
			[0.875]	[0.236]	[0.200]	[0.000]	[0.549]	[0.296]
2	2	5.991	12.062	7.742	8.488	50.734	0.648	18.908
			[0.002]	[0.021]	[0.014]	[0.000]	[0.723]	[0.000]

Panel (f): Test of exclusion

r	DGF	5% C.V.	$sent$	cpi	y	M	sp	i	μ
1	1	3.841	0.397	1.285	0.115	1.941	5.222	0.076	0.188
			[0.529]	[0.257]	[0.735]	[0.164]	[0.022]	[0.783]	[0.665]
2	2	5.991	6.130	38.796	1.514	25.981	6.819	0.918	25.772
			[0.047]	[0.000]	[0.469]	[0.000]	[0.033]	[0.632]	[0.000]

Panel (g): Tests for autocorrelation				Test for Arch			
LM(1):	ChiSqr(36)	= 93.437	[0.000]	LM(1):	ChiSqr(441)	= 626.546	[0.000]
LM(2):	ChiSqr(36)	= 57.196	[0.014]	LM(2):	ChiSqr(882)	= 1058.651	[0.000]
LM(3):	ChiSqr(36)	= 52.343	[0.038]	LM(3):	ChiSqr(1323)	= 1559.772	[0.000]
LM(4):	ChiSqr(36)	= 47.107	[0.102]	LM(4):	ChiSqr(1764)	= 1949.241	[0.001]

Note: See Table 1.

Table 3: Estimation results of the restricted error-correction model for Poland and the Czech Republic (sentiments as LHS variable)

	Czech Republic						Poland		
	Consumer Sentiments			Economic Sentiments			Economic Sentiments		
	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008
$\Delta sent$									
Constant	-8.192**	-8.223**	-9.827	1.596	-9.473	24.935	0.109	0.481	-0.751
	(-1.947)	(-2.088)	(-1.000)	(0.278)	(-0.500)	(1.206)	(0.123)	(0.503)	(-0.870)
ect_{t-1}^{1}	-6.292	-6.535	-9.948	3.324**	4.919*	-2.386	-0.117	-0.354	0.722
	(-1.042)	(-1.187)	(-0.798)	(2.241)	(1.811)	(-0.437)	(-0.202)	(-0.610)	(1.185)
ect_{t-1}^{2}	7.287***	7.410***	6.455	16.774**	12.690	13.128			
	(3.785)	(3.607)	(1.023)	(2.229)	(0.970)	(1.444)			
$\Delta sent_{t-1}$	-0.060	-0.035	-0.227**	-0.263***	-0.329***	-0.021	-0.131*	-0.105	-0.357***
	(-0.734)	(-0.472)	(-2.026)	(-3.932)	(-4.959)	(-0.237)	(-1.929)	(-1.428)	(-2.885)
Δy_{t-1}	1.916	4.614	13.459	16.165*	12.585	33.877***	34.122***	47.346***	6.596
	(0.254)	(0.618)	(1.336)	(1.668)	(1.069)	(5.088)	(3.026)	(3.230)	(0.545)
Δsp_{t-1}	3.947	2.610	32.229***	8.623**	7.622	9.420*	3.183	6.044	-3.647
	(1.001)	(0.654)	(3.680)	(2.008)	(1.517)	(1.679)	(0.315)	(0.513)	(-0.557)
Δsp_{t-1}^{us}	-7.439	-0.188	-24.152	15.563	16.468	5.999	2.947	1.356	13.436
	(-0.933)	(-0.020)	(-1.239)	(1.607)	(1.269)	(0.536)	(0.351)	(0.111)	(1.289)
$\Delta sent_{t-1}^{us}$	0.027	-0.033	0.174***	-0.061	-0.241**	0.043	0.028	0.080	-0.036
	(0.612)	(-0.882)	(2.886)	(-1.106)	(-2.118)	(0.939)	(0.425)	(0.562)	(-0.899)
$\Delta sent_{t-1}^{emu}$	0.248	0.245	0.479	0.641***	0.651**	0.539***	0.429***	0.348**	0.747***
	(1.145)	(1.144)	(1.192)	(3.045)	(2.218)	(3.029)	(2.991)	(2.220)	(4.334)
Δsp_{t-1}^{emu}	0.320	3.767	-53.954**	-15.035*	-10.339	-17.958	0.029	0.913	-2.319
	(0.042)	(0.457)	(-2.543)	(-1.947)	(-0.986)	(-1.602)	(0.003)	(-0.072)	(-0.320)

Note: The table reports the results of the restricted vector error-correction model outlined in the text for $\Delta sent$. For Czech Republic ect^1 refers to the first and ect^2 to the second cointegration vector in Table 1 and Table 2 and for Poland ect^1 refers to the cointegration vector in Table A2. For further notes see Table 1.

Table 4: Results of the restricted error-correction model for Poland and the Czech Republic (stock prices as LHS variable)

	Czech Republic						Poland		
	Consumer Sentiments			Economic Sentiments			Economic Sentiments		
	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008
Δsp									
constant	0.209***	0.440***	0.322***	-0.097	-0.764***	0.805***	0.016	0.000	0.017
	(3.764)	(6.445)	(4.755)	(-1.024)	(-3.261)	(2.586)	(0.937)	(0.020)	(0.399)
ect^1_{t-1}	0.311***	0.634***	0.399***	0.041*	0.080**	-0.135*	-0.011*	-0.008	-0.003
	(4.001)	(6.391)	(4.994)	(1.839)	(2.462)	(-1.694)	(-1.857)	(-1.394)	(-0.149)
ect^2_{t-1}	-0.069**	-0.208***	-0.100*	0.088	-0.405**	0.121			
	(-2.322)	(-5.365)	(-1.852)	(0.816)	(-2.280)	(0.761)			
$\Delta sent_{t-1}$	-0.001	-0.001	0.001	0.002	0.001	-0.001	0.000	0.000	0.002
	(-1.098)	(-0.721)	(0.337)	(1.536)	(0.668)	(-0.491)	(0.288)	(0.056)	(1.350)
Δy_{t-1}	0.131	0.098	0.280	-0.089	-0.084	0.198	0.131	0.238	0.038
	(0.891)	(0.576)	(1.462)	(-0.574)	(-0.471)	(0.914)	(0.795)	(0.919)	(0.143)
$\Delta \pi_{t-1}$	-0.330	0.080	-0.787	-0.190	0.144	-0.271	0.546	0.570	-0.127
	(-0.468)	(0.104)	(-1.424)	(-0.245)	(0.176)	(-0.383)	(0.864)	(0.656)	(-0.122)
Δsp_{t-1}	0.329***	0.144*	-0.041	0.335***	0.157	0.069	0.125*	0.204*	-0.186
	(4.957)	(1.770)	(-0.322)	(4.445)	(1.493)	(0.574)	(1.894)	(2.570)	(-1.342)
$\Delta sent^{us}_{t-1}$	0.000	-0.001	0.000	0.000	-0.003	0.000	0.002**	0.003*	0.001
	(-0.193)	(-1.528)	(-0.257)	(-0.300)	(-1.524)	(-0.099)	(2.583)	(1.742)	(1.594)
$\Delta sent^{emu}_{t-1}$	-0.005*	0.004	-0.003	-0.005*	-0.002	-0.009**	0.002	0.002	0.007*
	(1.833)	(1.118)	(0.862)	(2.124)	(0.467)	(2.954)	(0.939)	(0.806)	(2.238)
Δsp^{us}_{t-1}	0.226	0.078	-0.139	0.185	0.083	-0.094	-0.305*	-0.202	0.113
	(1.076)	(0.331)	(-0.504)	(0.901)	(0.344)	(-0.281)	(-1.748)	(-0.887)	(0.445)
Δsp^{emu}_{t-1}	0.056	0.271	0.632**	0.040	0.239	0.344	0.421***	0.283*	0.367
	(0.336)	(1.506)	(2.553)	(0.264)	(1.557)	(1.462)	(3.196)	(1.710)	(1.368)
Δi_{t-1}	-0.007***	-0.004	-0.082**	-0.006**	-0.006**	-0.067*	-0.022***	-0.023**	-0.062
	(-2.778)	(-1.555)	(-2.733)	(-2.553)	(-2.521)	(-1.899)	(-3.955)	(-4.533)	(-2.560)
ΔM_{t-1}	0.095	-0.508	-1.726***	0.050	-0.450	-0.851	-0.377	-0.256	-0.802***
	(0.202)	(-1.024)	(-3.545)	(0.097)	(-0.800)	(-1.604)	(-1.126)	(-0.568)	(-3.046)
$vola_{fx}$	-26.505	43.997**	-128.70***	-13.828	37.727*	-112.90**	11.901	23.317	10.324
	(-1.348)	(2.038)	(-6.427)	(-0.689)	(1.749)	(-6.651)	(0.711)	(1.256)	(0.339)
ΔY^{US}_{t-1}	1.543	-1.946*	2.370***	1.815	-2.178**	2.347**	1.334*	1.365	1.632*
	(1.298)	(-1.886)	(3.031)	(1.481)	(-2.039)	(3.498)	(1.836)	(1.020)	(1.860)
ΔY^{EMU}_{t-1}	-0.255	-0.829	-0.687	-0.198	-0.417	-0.872*	0.036	-0.216	-0.113
	(-0.551)	(-1.511)	(-1.514)	(-0.413)	(-0.674)	(-1.881)	(0.075)	(-0.281)	(-0.190)

Note: The table reports the results of the restricted vector error-correction model outlined in the text for Δsp. For Czech Republic ect^1 refers to the first and ect^2 to the second cointegration vector in Table 1 and Table 2 and for Poland ect^1 refers to the cointegration vector in Table A2. For further notes see Table 1.

Table 5: Results of the restricted error-correction model for Poland and the Czech Republic (income as LHS variable)

	Czech Republic						Poland		
	Consumer Sentiments			Economic Sentiments			Economic Sentiments		
	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008
ΔY									
$constant$	0.069**	0.139**	0.075	0.028	-0.057	0.391*	0.008*	0.009	0.000
	(1.961)	(2.443)	(1.365)	(0.706)	(-0.386)	(1.967)	(1.884)	(1.622)	(-0.050)
ect^1_{t-1}	0.059	0.154*	0.047	-0.036***	-0.031	-0.112**	-0.003*	-0.003	0.002
	(1.177)	(1.864)	(0.649)	(-3.007)	(-1.410)	(-2.482)	(-1.846)	(-1.302)	(0.317)
ect^2_{t-1}	-0.051***	-0.089***	-0.062**	-0.140**	-0.202**	-0.144			
	(-3.162)	(-3.288)	(-2.151)	(-2.284)	(-2.107)	(-1.295)			
$\Delta sent_{t-1}$	0.001	0.001	0.000	0.001*	0.001**	-0.001	0.000	0.001	-0.001
	(1.366)	(0.999)	(0.363)	(1.729)	(2.028)	(-1.153)	(-0.664)	(-0.361)	(-1.476)
Δy_{t-1}	-0.333***	-0.341***	-0.302***	-0.326***	-0.355***	-0.303**	-0.390**	-0.455***	-0.150
	(-3.647)	(-3.012)	(-3.027)	(-3.658)	(-3.188)	(-2.631)	(-4.772)	(-4.845)	(-1.561)
Δsp^{us}_{t-1}	0.102	0.055	0.301***	0.113	0.067	0.242***	0.013	-0.019	-0.042
	(1.000)	(0.461)	(3.494)	(1.185)	(0.643)	(2.947)	(0.2229	(-0.293)	(-0.359)
Δsp^{emu}_{t-1}	0.002	0.047	-0.215	-0.044	0.045	-0.198	-0.030	-0.031	0.042
	(0.024)	(0.556)	(-1.588)	(-0.574)	(0.454)	(-1.475)	(-0.467)	(-0.360)	(0.406)
Δsp_{t-1}	0.034	-0.005	0.121	0.082*	0.061	0.089	0.053	0.035	0.110
	(0.889)	(-0.109)	(2.216)	(1.970)	(1.006)	(1.627)	(1.063)	(0.549)	(1.774)
$\Delta sent^{us}_{t-1}$	-0.001***	-0.001***	0.000	-0.001**	-0.003***	0.000	0.000	0.000	0.000
	(-3.709)	(-3.241)	(-1.477)	(-2.307)	(-4.520)	(0.374)	(0.730)	(0.596)	(0.617)
$\Delta sent^{emu}_{t-1}$	0.004***	0.004**	0.001	0.000	0.000	0.001	0.002*	0.001	0.002
	(2.792)	(2.385)	(0.614)	(0.274)	(-0.113)	(0.664)	(1.860)	(0.501)	(1.215)
Δi_{t-1}	0.000	0.000	0.014	-0.001	-0.001	0.013	-0.002	-0.001	-0.010
	(0.179)	(-0.391)	(1.151)	(-0.638)	(-0.694)	(1.050)	(-0.794)	(-0.375)	(-1.019)
ΔM_{t-1}	-0.250	-0.373	-0.578*	-0.335	-0.504	-0.658**	0.260	0.156	0.299
	(-0.798)	(-0.878)	(-1.995)	(-1.143)	(-1.270)	(-2.394)	(1.490)	(0.822)	(1.339)
ΔY^{US}_{t-1}	0.340	0.188	0.362	0.368	0.283	0.246	0.224	0.454	0.203
	(1.260)	(0.340)	(1.506)	(1.547)	(0.554)	(0.975)	(1.243)	(1.084)	(1.204)
ΔY^{EMU}_{t-1}	0.236	0.189	0.228	0.174	0.213	0.194	-0.052	-0.088	-0.322
	(1.132)	(0.605)	(0.973)	(0.872)	(0.662)	(0.880)	(-0.269)	(-0.338)	(-1.363)

Note: The table reports the results of the restricted vector error-correction model outlined in the text for ΔY. For Czech Republic ect^1 refers to the first and ect^2 to the second cointegration vector in Table 1 and Table 2 and for Poland ect^1 refers to the cointegration vector in Table A2. For further notes see Table 1.

Table 6: Estimation results of the restricted error-correction model for Hungary and Slovakia (sentiments as LHS variable)

	Hungary						Slovakia		
	Consumer Sentiments			Economic Sentiments			Economic Sentiments		
	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008
$\Delta sent$									
Constant	-0.652	-1.407	-0.863	-0.122	-0.271	-8.795*	-1.025	-3.231	-2.577
	(-1.091)	(-1.252)	(-0.795)	(-0.064)	(-0.146)	(-1.968)	(-0.768)	(-0.865)	(-1.299)
ect^1_{t-1}	6.333	8.651	16.693	1.486	1.059	-10.426	16.102***	27.706***	6.703
	(0.648)	(0.581)	(0.655)	(0.115)	(0.082)	(-0.378)	(2.856)	(3.264)	(1.183)
ect^2_{t-1}	7.649	24.568	-16.481	-0.239	0.122	6.583	-1.938*	7.773	19.710*
	(0.422)	(1.017)	(-0.710)	(-0.186)	(0.082)	(1.636)	(-0.156)	(0.574)	(1.922)
ect^3_{t-1}							-1.814	11.797	23.943
							(-0.108)	(0.752)	(1.602)
$\Delta sent_{t-1}$	0.051	-0.209*	0.380***	-0.260***	-0.237**	-0.336***	-0.105	0.102	-0.189
	(0.363)	(-1.947)	(5.062)	(-4.387)	(-2.638)	(-3.183)	(-1.177)	(0.883)	(-1.396)
Δy_{t-1}	-19.644	-17.476	-9.005	0.585	32.637**	-77.004**	3.048	79.052**	-31.989***
	(-0.967)	(-0.789)	(-0.336)	(0.033)	(2.061)	(-2.654)	(0.169)	(2.342)	(-6.233)
Δsp_{t-1}	3.515	1.694	8.529	15.392***	16.125***	33.576*	-1.392	-17.693*	5.192
	(0.603)	(0.298)	(0.896)	(2.995)	(3.400)	(1.745)	(-0.193)	(-1.789)	(0.734)
Δsp^{us}_{t-1}	-5.250	17.102	-68.602*	4.396	9.173	-33.593	11.682	-11.109	29.514*
	(-0.335)	(1.110)	(-1.878)	(0.201)	(0.404)	(-0.770)	(0.782)	(-0.624)	(1.732)
$\Delta sent^{us}_{t-1}$	0.034	-0.115	0.120	-0.026	-0.078	-0.090	-0.071	-0.131	0.007
	(0.395)	(-0.831)	(1.239)	(-0.292)	(-0.497)	(-0.838)	(-0.832)	(-0.688)	(0.080)
$\Delta sent^{emu}_{t-1}$	-0.016	0.149	-0.148	0.949***	0.967***	0.816	0.915***	0.207	1.311***
	(-0.075)	(0.518)	(-0.505)	(3.020)	(3.230)	(1.390)	(2.937)	(0.788)	(3.197)
Δsp^{emu}_{t-1}	6.315	-10.355	53.053	-15.114	-28.669**	26.488	-9.244	-8.835	-7.355
	(0.484)	(-0.837)	(1.591)	(-1.025)	(-2.065)	(0.582)	(-0.942)	(-0.657)	(-0.457)

Note: The table reports the results of the restricted vector error-correction model outlined in the text for $\Delta sent$. In the case of Slovakia, ect^1 refers to the first, ect^2 to the second and ect^3 to the third cointegration vector in Tables. For Hungary ect^1 refers to the first and ect^2 to the second cointegration vector in Table A3 and A4. For further notes see Table 1.

Table 7: Estimation results for the restricted error-correction model for Hungary and the Slovakia (stock prices as LHS variable)

	Hungary						Slovakia		
	Consumer Sentiments			Economic Sentiments			Economic Sentiments		
	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008
Δsp									
constant	0.023*	0.066***	0.045**	0.030	0.047	0.041	-0.019	-0.122***	-0.031
	(1.912)	(3.032)	(2.583)	(1.474)	(1.166)	(1.177)	(-1.423)	(-2.913)	(-1.250)
ect_{t-1}^{1}	0.053	0.433*	-0.291	0.227	0.270	0.332	-0.077	-0.027	-0.112
	(0.281)	(1.840)	(-1.188)	(1.588)	(0.958)	(1.617)	(-1.368)	(-0.369)	(-1.100)
ect_{t-1}^{2}	-0.596**	-1.830***	-0.111	-0.011	-0.034	-0.009	0.241**	0.624***	0.367**
	(-2.347)	(-4.680)	(-0.543)	(-0.838)	(-1.002)	(-0.239)	(2.178)	(3.898)	(2.009)
ect_{t-1}^{3}							0.306**	0.743***	0.426*
							(2.015)	(3.746)	(1.691)
$\Delta sent_{t-1}$	0.000	0.000	-0.001	-0.001	0.000	-0.001	0.000	0.000	0.002*
	(-0.218)	(0.274)	(-0.804)	(-0.821)	(0.021)	(-0.821)	(-0.377)	(-0.335)	(1.833)
Δy_{t-1}	-0.123	-0.264	-0.185	-0.077	-0.134	0.106	0.033	0.417**	-0.095
	(-0.734)	(-1.290)	(-1.026)	(-0.452)	(-0.588)	(0.467)	(0.236)	(2.388)	(-1.040)
$\Delta\pi_{t-1}$	-0.668	1.235	-1.772*	-0.206	1.127	-1.699***	-0.828	-0.140	-2.148**
	(-0.970)	(1.348)	(-2.593)	(-0.300)	(1.089)	(-2.713)	(-1.203)	(-0.254)	(-2.122)
Δsp_{t-1}	0.132*	0.151*	-0.013	0.093	0.144	-0.050	0.366***	0.278**	0.215
	(1.747)	(1.747)	(-0.091)	(1.104)	(1.225)	(-0.352)	(3.633)	(2.212)	(1.417)
$\Delta sent_{t-1}^{us}$	0.001*	0.001	0.002**	0.000	0.004*	0.002	-0.001	0.000	-0.001
	(1.910)	(1.254)	(2.239)	(0.085)	(1.715)	(1.621)	(-0.518)	(-0.201)	(-0.730)
$\Delta sent_{t-1}^{emu}$	-0.001	0.000	-0.002	0.000	0.003	0.005	0.001	0.000	0.003
	(-0.385)	(0.030)	(-0.422)	(0.152)	(0.705)	(1.298)	(0.423)	(0.022)	(0.794)
Δsp_{t-1}^{us}	0.061	-0.019	-0.439	0.116	0.289	-0.279	0.031	0.024	-0.242
	(0.202)	(-0.052)	(-1.570)	(0.392)	(0.713)	(-1.210)	(0.133)	(0.111)	(-0.621)
Δsp_{t-1}^{emu}	0.191	0.213	0.737**	0.208	0.067	0.583**	-0.001	-0.088	0.422
	(0.976)	(0.925)	(2.364)	(1.057)	(0.273)	(2.326)	(-0.003)	(-0.482)	(1.234)
Δi_{t-1}	-0.011**	-0.013*	-0.026**	-0.013**	-0.007	-0.029***	-0.071**	-0.079***	-0.222**
	(-2.379)	(-1.925)	(-2.528)	(-2.446)	(-0.977)	(-3.266)	(-2.071)	(-2.798)	(-2.271)
$vola_{t-1}^{fx}$	-16.173	-75.380*	-68.903***	-0.267	28.840	-23.290	2.145	22.264	-24.853**
	(-0.845)	(-1.746)	(-2.693)	(-0.016)	(0.942)	(-1.291)	(0.110)	(0.996)	(-2.283)
ΔY_{t-1}^{US}	0.976	-0.242	1.664	0.708	-1.963	2.803***	0.521	0.840	1.366***
	(0.753)	(-0.089)	(1.618)	(0.576)	(-0.753)	(2.944)	(0.797)	(0.680)	(3.102)
ΔY_{t-1}^{EMU}	0.738	0.853	0.197	0.551	0.487	-0.108	-0.229	-0.703	-0.204
	(1.058)	(0.820)	(0.401)	(0.763)	(0.428)	(-0.217)	(-0.594)	(-1.174)	(-0.335)

Note: The table reports the results of the restricted vector error-correction model outlined in the text for Δsp. In the case of Slovakia, ect^1 refers to the first, ect^2 to the second and ect^3 to the third cointegration vector in Tables. For Hungary ect^1 refers to the first and ect^2 to the second cointegration vector in Table A3 and A4. For further notes see Table 1.

Table 8: Results of the restricted error-correction model for Hungary and the Slovakia (income as LHS variable)

	Hungary						Slovakia		
	Consumer Sentiments			Economic Sentiments			Economic Sentiments		
	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008	1997-2008	1997-2003	2004-2008
ΔY									
$constant$	0.006	0.011**	0.000	0.014	0.036**	-0.002	0.009	0.041***	0.048***
	(1.522)	(2.351)	(-0.030)	(1.369)	(2.228)	(-0.110)	(1.027)	(2.048)	(4.664)
ect^1_{t-1}	-0.211***	-0.303***	-0.059	0.058	0.181	-0.054	-0.083**	-0.038	-0.156**
	(-3.565)	(-4.286)	(-0.332)	(0.887)	(1.607)	(-0.387)	(-2.166)	(-1.514)	(-2.587)
ect^2_{t-1}	0.432***	0.631***	0.181	-0.005	-0.017	0.001	-0.080	-0.131	-0.075
	(4.142)	(4.039)	(1.433)	(-0.957)	(-1.266)	(0.049)	(-1.129)	(-1.301)	(-0.785)
ect^3_{t-1}							-0.123	-0.148	-0.028
							(-1.260)	(-1.167)	(-0.215)
$\Delta sent_{t-1}$	0.000	-0.001**	0.001	0.000	0.000	0.001*	0.000	0.000	0.004***
	(-0.809)	(-2.411)	(1.570)	(0.974)	(0.834)	(1.794)	(0.894)	(-1.223)	(2.787)
Δy_{t-1}	-0.304***	-0.344***	-0.014	-0.330***	-0.381***	-0.121	-0.443***	-0.389***	-0.608***
	(-4.276)	(-4.548)	(-0.125)	(-4.505)	(-4.314)	(-1.015)	(-6.372)	(-4.804)	(-7.501)
Δsp^{us}_{t-1}	0.075	-0.035	0.076	-0.005	-0.150*	-0.132	0.185	0.119	0.417*
	(0.688)	(-0.441)	(0.401)	(-0.050)	(-1.877)	(-0.927)	(1.586)	(1.304)	(1.659)
Δsp^{emu}_{t-1}	-0.035	0.030	0.057	-0.006	0.084	0.155	-0.066	-0.049	-0.203
	(-0.457)	(0.391)	(0.401)	(-0.076)	(1.102)	(1.189)	(-0.715)	(-0.620)	(-1.058)
Δsp_{t-1}	0.031	0.016	-0.043	0.030	0.032	-0.050	0.028	0.058	0.023
	(1.018)	(0.560)	(-0.674)	(0.907)	(1.337)	(-0.655)	(0.600)	(1.635)	(0.281)
$\Delta sent^{us}_{t-1}$	-0.001**	-0.001	-0.001***	-0.001*	0.000	-0.001*	-0.001	-0.002***	-0.001
	(-2.832)	(-1.483)	(-3.638)	(-1.783)	(-0.472)	(-1.736)	(-1.193)	(-2.963)	(-0.929)
$\Delta sent^{emu}_{t-1}$	0.002	0.002	0.000	0.002*	0.000	0.003	0.004**	0.003	0.002
	(1.470)	(1.395)	(-0.110)	(1.662)	(0.100)	(1.492)	(2.059)	(1.539)	(0.638)
Δi_{t-1}	-0.002	0.006	-0.011**	-0.005	0.002	-0.012**	-0.015	-0.021	0.018
	(-0.614)	(1.616)	(-2.102)	(-1.297)	(0.663)	(-2.100)	(-1.165)	(-1.477)	(0.496)
ΔY^{US}_{t-1}	0.502**	0.636	0.214	0.470**	0.888*	0.107	0.214	-0.497	0.805**
	(2.362)	(1.615)	(0.910)	(2.125)	(1.881)	(0.477)	(0.660)	(-0.987)	(2.169)
ΔY^{EMU}_{t-1}	0.342	-0.510	0.980***	0.362	-0.421	0.990***	0.258	-0.156	-0.100
	(1.096)	(-1.478)	(4.013)	(1.166)	(-1.123)	(4.426)	(0.775)	(-0.557)	(-0.171)

Note: The table reports the results of the restricted vector error-correction model outlined in the text for ΔY. In the case of Slovakia, ect^1 refers to the first, ect^2 to the second and ect^3 to the third cointegration vector in Tables. For Hungary ect^1 refers to the first and ect^2 to the second cointegration vector in Table A3 and A4. For further notes see Table 1.

Appendix

Table A1: Cointegration analysis for Slovakia (economic sentiments)

Panel (a): I (1)-Analysis (Rank Test)

p-r	r	Eig.Value	Trace	Trace*	Frac95	P-Value
5	0	0.301	122.687	109.414	76.813	0.000
4	1	0.183	72.291	42.000	53.945	0.000
3	2	0.146	43.716	11.151	35.070	0.004
2	3	0.107	21.440	7.185	20.164	0.032

Panel (b): Cointegration vectors

	sent	*cpi*	*y*	*sp*	*i*	*constant*
Beta(1)	-0.009					1.000
	(-59.526)					
Beta(2)			0.513	-0.478		1.000
			(5.223)	(-5.645)		
Beta(3)		-0.642		0.296	-0.134	1.000
		(-11.403)		(5.963)	(-13.992)	

Panel (c): Test of restricted model

CHISQR(3) = 5.329 [0.149]

Panel (d): Adjustment coefficients

	$\Delta sent$	Δcpi	Δy	Δsp	Δi
Alpha(1)	15.681	0.024	-0.168	-0.153	0.122
	(2.355)	(3.136)	(-3.880)	(-2.405)	(0.753)
Alpha(2)	-15.545	0.030	0.024	-0.087	1.408
	(-1.121)	(1.900)	(0.261)	(-0.658)	(4.160)
Alpha(3)	-20.659	0.038	0.017	-0.144	2.131
	(-1.012)	(1.662)	(0.130)	(-0.743)	(4.277)

Panel (e): Test of weak exogeneity

r	DGF	5% C.V.	*sent*	*cpi*	*y*	*sp*	*i*
1	1	3.841	0.064	18.844	3.353	3.964	0.123
			[0.800]	[0.000]	[0.067]	[0.046]	[0.726]
2	2	5.991	2.026	25.121	7.579	5.095	1.589
			[0.363]	[0.000]	[0.023]	[0.078]	[0.452]
3	3	7.815	2.618	31.373	9.824	6.540	6.538
			[0.454]	[0.000]	[0.020]	[0.088]	[0.088]
4	4	9.488	4.678	41.860	15.102	17.093	15.855
			[0.322]	[0.000]	[0.004]	[0.002]	[0.003]

Panel (f): Test of exclusion

r	DGF	5% C.V.	*sent*	*cpi*	*y*	*sp*	*i*	*constant*
1	1	3.841	9.530	2.293	2.558	0.340	0.648	2.615
			[0.002]	[0.130]	[0.110]	[0.560]	[0.421]	[0.106]
2	2	5.991	14.981	2.725	2.946	0.416	0.969	3.212
			[0.001]	[0.256]	[0.229]	[0.812]	[0.616]	[0.201]
3	3	7.815	20.482	8.978	8.735	3.085	6.913	9.459
			[0.000]	[0.030]	[0.033]	[0.379]	[0.075]	[0.024]
4	4	9.488	31.023	18.042	12.031	10.903	17.499	19.350
			[0.000]	[0.001]	[0.017]	[0.028]	[0.002]	[0.001]

Panel (g): Tests for autocorrelation				Test for Arch			
LM(1):	ChiSqr(25)	= 29.033	[0.263]	LM(1):	ChiSqr(225)	= 370.545	[0.000]
LM(2):	ChiSqr(25)	= 22.678	[0.596]	LM(2):	ChiSqr(450)	= 664.722	[0.000]
LM(3):	ChiSqr(25)	= 36.713	[0.061]	LM(3):	ChiSqr(675)	= 946.197	[0.000]
LM(4):	ChiSqr(25)	= 23.561	[0.545]	LM(4):	ChiSqr(900)	= 1192.465	[0.000]

Note: See Table 1.

Table A2: Cointegration analysis for Poland (economic sentiments)

Panel (a): I (1)-Analysis (Rank Test)

p-r	r	Eig.Value	Trace	Trace*	Frac95	P-Value
6	0	0.330	149.188	100.393	103.679	0.000
5	1	0.240	93.047	58.037	76.813	0.001
4	2	0.151	54.678	27.937	53.945	0.043
3	3	0.097	31.756	16.982	35.07	0.112
2	4	0.07	17.415	5.263	20.164	0.119
1	5	0.05	7.181	4.871	9.142	0.12

Panel (b): Cointegration vectors

	$sent$	cpi	y	M	sp	i	μ
Beta(1)		5.329***	-6.708***		1	-0.104***	-3.714***
		(4.791)	(-11.015)			(-5.903)	(-0.974)

Panel (c): Test of restricted model

CHISQR(2) = 1.291 [0.524]

Panel (d): Adjustment coefficients

	$\Delta sent$	Δcpi	Δy	ΔM	Δsp	Δi
Alpha(1)	0.201	-0.003***	0.01**	-0.012***	0.041***	0.202*
	(0.359)	(-3.522)	(2.448)	(-4.472)	(3.075)	(1.906)

Panel (e): Test of weak exogeneity

r	DGF	5% C.V.	$sent$	cpi	y	M	sp	i
1	1	3.841	0.029	6.588	3.395	7.830	6.194	3.125
			[0.866]	[0.010]	[0.065]	[0.005]	[0.013]	[0.077]
2	2	5.991	0.666	9.018	14.245	20.491	6.469	6.846
			[0.717]	[0.011]	[0.001]	[0.000]	[0.039]	[0.033]

Panel (f): Test of exclusion

r	DGF	5% C.V.	$sent$	cpi	y	M	sp	i	μ
1	1	3.841	0.948	3.402	7.253	0.716	1.816	10.136	1.262
			[0.330]	[0.065]	[0.007]	[0.397]	[0.178]	[0.001]	[0.261]
2	2	5.991	0.954	4.175	13.059	1.504	10.003	25.537	3.650
			[0.621]	[0.124]	[0.001]	[0.471]	[0.007]	[0.000]	[0.161]

Panel (g): Tests for autocorrelation				Test for Arch			
LM(1):	ChiSqr(36)	= 49.500	[0.066]	LM(1):	ChiSqr(441)	= 465.023	[0.207]
LM(2):	ChiSqr(36)	= 50.805	[0.052]	LM(2):	ChiSqr(882)	= 974.922	[0.016]
LM(3):	ChiSqr(36)	= 32.652	[0.629]	LM(3):	ChiSqr(1323)	= 1522.447	[0.000]
LM(4):	ChiSqr(36)	= 30.160	[0.742]	LM(4):	ChiSqr(1764)	= 1977.951	[0.000]

Note: See Table 1.

Table A3: Cointegration analysis for Hungary (economic sentiments)

Panel (a): I (1)-Analysis (Rank Test)

p-r	r	Eig.Value	Trace	Trace*	Frac95	P-Value
5	0	0.337	114.972	102.003	76.813	0.000
4	1	0.190	57.091	35.453	53.945	0.025
3	2	0.101	27.430	12.119	35.070	0.271
2	3	0.050	12.411	4.090	20.164	0.421

Panel (b): Cointegration vectors

	$sent$	cpi	y	sp	i	constant
Beta(1)		-0.907	0.700			1.000
		(-8.610)	(6.633)			
Beta(2)		-0.321		0.058	-0.009	1.000
		(-13.692)		(5.126)	(-11.517)	

Panel (c): Test of restricted model

CHISQR(3) = 5.147 [0.161]

Panel (d): Adjustment coefficients

	$\Delta sent$	Δcpi	Δy	Δsp	Δi
Alpha(1)	-24.636	0.083	0.014	0.074	-0.828
	(-2.095)	(7.184)	(0.261)	(0.461)	(-0.624)
Alpha(2)	70.292	-0.048	0.411	-0.058	4.457
	(3.127)	(-2.157)	(3.967)	(-0.189)	(1.757)

Panel (e): Test of weak exogeneity

r	DGF	5% C.V.	$sent$	cpi	y	sp	i
1	1	3.841	0.021	26.124	2.743	0.339	0.464
			[0.884]	[0.000]	[0.098]	[0.560]	[0.496]
2	2	5.991	4.568	40.755	12.403	0.380	2.737
			[0.102]	[0.000]	[0.002]	[0.827]	[0.254]
3	3	7.815	11.723	47.887	19.796	0.382	3.629
			[0.008]	[0.000]	[0.000]	[0.944]	[0.304]
4	4	9.488	13.278	48.764	21.591	1.820	4.466
			[0.010]	[0.000]	[0.000]	[0.769]	[0.347]

Panel (f): Test of exclusion

r	DGF	5% C.V.	$sent$	cpi	y	sp	i	*constant*
1	1	3.841	2.446	22.546	15.838	2.476	0.103	9.871
			[0.118]	[0.000]	[0.000]	[0.116]	[0.749]	[0.002]
2	2	5.991	2.536	23.404	18.558	11.145	13.079	17.081
			[0.281]	[0.000]	[0.000]	[0.004]	[0.001]	[0.000]
3	3	7.815	8.173	29.489	23.006	17.463	18.156	23.986
			[0.043]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]
4	4	9.488	8.467	29.730	23.248	17.530	18.246	25.107
			[0.076]	[0.000]	[0.000]	[0.002]	[0.001]	[0.000]

Panel (g): Tests for autocorrelation				Test for Arch			
LM(1):	ChiSqr(25)	= 31.729	[0.166]	LM(1):	ChiSqr(225)	= 316.996	[0.000]
LM(2):	ChiSqr(25)	= 30.311	[0.213]	LM(2):	ChiSqr(450)	= 513.113	[0.021]
LM(3):	ChiSqr(25)	= 20.369	[0.727]	LM(3):	ChiSqr(675)	= 751.449	[0.021]
LM(4):	ChiSqr(25)	= 13.999	[0.962]	LM(4):	ChiSqr(900)	= 1010.896	[0.006]

Note: See Table 1.

Table A4: Cointegration analysis for Hungary (consumer sentiments)

Panel (a): I (1)-Analysis (Rank Test)

p-r	r	Eig.Value	Trace	Trace*	Frac95	P-Value
5	0	0.335	117.821	103.682	76.813	0.000
4	1	0.212	60.245	34.754	53.945	0.012
3	2	0.111	26.698	13.890	35.070	0.308
2	3	0.051	10.148	3.105	20.164	0.631

Panel (b): Cointegration vectors

	$sent$	cpi	y	sp	i	*constant*
Beta(1)		-0.898	0.690			1.000
		(-9.889)	(7.582)			
Beta(2)		-0.328		0.062	-0.008	1.000
		(-14.883)		(5.768)	(-10.675)	

Panel (c): Test of restricted model

CHISQR(3) = 5.051 [0.168]

Panel (d): Adjustment coefficients

	$\Delta sent$	Δcpi	Δy	Δsp	Δi
Alpha(1)	9.811	0.104	-0.119	0.027	-2.220
	(0.744)	(6.869)	(-1.669)	(0.128)	(-1.264)
Alpha(2)	-16.070	-0.062	0.541	0.076	5.718
	(-0.770)	(-2.596)	(4.789)	(0.229)	(2.059)

Panel (e): Test of weak exogeneity

r	DGF	5% C.V.	$sent$	cpi	y	sp	i
1	1	3.841	0.203	21.938	2.089	0.135	0.145
			[0.652]	[0.000]	[0.148]	[0.714]	[0.704]
2	2	5.991	0.325	38.006	14.824	0.188	7.108
			[0.850]	[0.000]	[0.001]	[0.910]	[0.029]
3	3	7.815	4.609	47.070	22.812	0.377	14.097
			[0.203]	[0.000]	[0.000]	[0.945]	[0.003]
4	4	9.488	8.099	51.225	26.951	3.137	17.543
			[0.088]	[0.000]	[0.000]	[0.535]	[0.002]

Panel (f): Test of exclusion

r	DGF	5% C.V.	$sent$	cpi	y	sp	i	*constant*
1	1	3.841	0.167	19.054	9.231	2.038	0.007	5.678
			[0.683]	[0.000]	[0.002]	[0.153]	[0.935]	[0.017]
2	2	5.991	3.133	22.679	20.862	12.788	15.706	20.970
			[0.209]	[0.000]	[0.000]	[0.002]	[0.000]	[0.000]
3	3	7.815	11.662	23.577	22.020	18.927	24.690	28.871
			[0.009]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
4	4	9.488	16.021	24.321	23.164	18.941	27.125	30.893
			[0.003]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]

Panel (g): Tests for autocorrelation				Test for Arch			
LM(1):	ChiSqr(25)	= 27.089	[0.351]	LM(1):	ChiSqr(225)	= 289.355	[0.002]
LM(2):	ChiSqr(25)	= 24.541	[0.488]	LM(2):	ChiSqr(450)	= 507.857	[0.030]
LM(3):	ChiSqr(25)	= 15.164	[0.937]	LM(3):	ChiSqr(675)	= 742.520	[0.036]
LM(4):	ChiSqr(25)	= 9.846	[0.997]	LM(4):	ChiSqr(900)	= 1011.094	[0.006]

Note: See Table 1.