

Academy of Economic Studies
Doctoral School of Finance and
Banking

Stock Market and Exchange Rate Interactions in Emerging Europe

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Stock Market and Exchange Rate Interactions in Emerging Europe

Introduction

Why is it important to study stock market – exchange rate interactions in a global environment?

- It is useful
- for economists evaluating the theoretical framework of the impact of exchange rates on macroeconomic performance (for which stock market returns may act as a proxy)
 - for the international investors trying to determine whether and how much they have to hedge their currency exposure
 - for policymakers in assessing the impact of global factors on the exchange rate, and of the exchange rate on the stock market
 - for local stock market investors in taking into account the impact of exchange rate moves

Stock Market and Exchange Rate Interactions in Emerging Europe

Literature Review

Theoretical background

Traditional flow approach to exchange rates based on the goods markets (Dornbusch and Fisher, 1980) points that *real exchange rates affect the competitiveness of the national economy*. Therefore stock markets should react negatively to a national currency appreciation.

A further enhancement is done by Ma and Kao (1990): depending on the economy, if it is import-oriented the currency appreciation leads to a positive response in stock prices. When the economy is export-oriented, the stock market appreciates in response to a negative shock in the value of the currency.

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Literature Review (2)

Portfolio approach, used by Krueger (1983), Branson (1983), Gavin (1989) argues that exchange rates should reflect *relative demand for domestic versus foreign assets*. If the demand for domestic stocks increases, foreign investors decide to invest in the local stock market, leading to foreign equity inflows. At the same time, the appetite for stock investment leads to a rise in interest rates, that increases the desire to place foreign capital at work in the fixed income market, further increasing the value of the domestic currency.

Phylaktis and Ravazzolo (2005): a demand shock in a large foreign economy (that can be detected in stock market returns) creates more demand for exports from an emerging country. That leads to an emerging stock market increase and an exchange rate decrease (rise in emerging currency value)

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Literature Review (3)

Current perspectives

Divergence of opinions in the literature on the subject of stock - exchange rate relationship

Empirical findings of the sign of are heterogeneous: Aggarwal (1981) US dollar has a positive impact on stock market

Ajayi and Mougoue (1996) 8 industrial countries, negative short-run, positive long-run stock market effect on currency value

Nieh and Lee (2001) detected on G7 countries no relevant long-run relationship between stocks and exchange rates

Abdalla and Murinde (1997) unidirectional causality from exchange rates to stock prices in India, and the opposite direction of causality for the Philippine

Stavárek (2005) study P, CZ, HU, SK long run relationships between exchange rates and stock markets do not appear, with the given explanation of the weak reliability of the stock markets in Emerging Europe to reflect and affect the real economy (data ends 2003) - *one* of the reasons for choosing the sample time to begin in 2003

Grambovas (2003) HU, GR, CZ two-way relationship between foreign exchange and stock markets for Greece and Hungary, but not for Czech Republic

Ulku (2012) 8 Central and Eastern European countries, in a country with a large external deficit (a net receiver of financial flows), the response of the stock market and and currency value to a positive shock in developed markets response is positive

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Literature Review (4)

Volatility

Engle, Ito, Lin (1990) provide the framework of volatility spillover study, using GARCH and VAR. Decide that there are volatility spillovers from one market to another.

Diebold and Yilmaz (2008) define a spillover index using variance decompositions, they find that return spillovers display a gentle increasing trend while volatility spillovers display bursts

Bala and Premaratne (2004) 1992 – 2002, univariate GARCH, VAR and MGARCH to study volatility co-movement between Singapore and stock markets of US, UK, Hong Kong and Japan. They found a high degree of volatility co-movement between Singapore stock market and that of Hong Kong, US, Japan and UK. Since they did allow for spillover from Singapore to other markets, they found small but significant volatility spillover from Singapore into Hong Kong, Japan and US markets.

Stock Market and Exchange Rate Interactions in Emerging Europe

Data

Data: Time Series

- Emerging Europe: Daily and Monthly series for the stock market main index and currency rate vs. Euro for *Romania, Poland, Hungary* and *Czech Republic*
 - Global: Daily and Monthly S&P500, MSCI Europe and VIX data
 - Closing values for all stock indices, open values for daily S&P500 and VIX, due to timezone differences, official rates for exchange rates
- Used exchange rate versus Euro, because of Euro-area economic and financial close relationship
 - From January 2003 until December 2011
 - Sources: Respective Central Banks, Respective Exchanges, Reuters where data was not provided free of charge

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Data (2)

Data treatment (daily frequency)

where on a specific date, three or more out of all the time series (4 exchange rates, 6 stock indices, 1 volatility index) lacked data (because of regional holiday generally), the data for the respective date was removed from the sample

where one or two data points lacked in the cross section, filled them with the average of the closest two other values

Stock Market and Exchange Rate Interactions in Emerging Europe

Methodology

- Eviews (ADF, Johansen, GARCH) and JMulti (SVAR estimation, IRF and FEV study)
- **Part 1: Studying interactions using returns**
- Stationary time series – exchange rate, stock indices, VIX? ADF says No
- Log difference used to get stationary series
- Testing for cointegration using Johansen procedure – no cointegrating relationships found for any country
- Structural VAR analysis with 5 variables (S&P500, VIX, MSCI Europe, CEE currency pair, CEE stock index)
- Checking for stability
- Lag order selection using AIC, SC, HQ, when they don't agree, longest lag chosen – AIC provided the longest lag order
- Impulse Response Analysis
- Forecast Error Variance Decomposition

Stock Market and Exchange Rate Interactions in Emerging Europe

Methodology (2)

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + \varepsilon_t \quad (1)$$

$y_t' = [S \ V \ E \ I \ F]$ with **S** being log returns of S&P500, **V** log returns of CBOE Volatility Index VIX, **E** log returns of MSCI Europe, **I** log returns of local stock index for each of the 4 countries and **F** log returns of the exchange rate of the EE currency vs. the Euro in each of the 4 countries studied

A_i with $i=1..p$, where p is the lag order, is a 5 x 5 matrix of VAR coefficients

ε_t is a 5 x 1 vector of i.i.d errors

for concision, deterministic terms are not included, as they do not help with IRF and FEV analysis.

Our intention is to restrict the local Emerging Europe stock indices and exchange rates from affecting global indices, an assumption that appears generally plausible given the size of the Emerging Europe economies compared to the whole of US and European economies

Stock Market and Exchange Rate Interactions in Emerging Europe

Methodology (3)

block exogeneity:

$$A(L)*y(t) = \varepsilon t \quad (2)$$

$A(L)$ is a 5 x 5 matrix polynomial in the lag operator and εt is a 5 x 1 vector of structural innovations.

Restrictions imposed on $A(L)$

$$A(L) = \begin{bmatrix} A11(L) & A12(L) & A13(L) & 0 & 0 \\ A21(L) & A22(L) & A23(L) & 0 & 0 \\ A31(L) & A32(L) & A33(L) & 0 & 0 \\ A41(L) & A42(L) & A43(L) & A44(L) & A45(L) \\ A51(L) & A52(L) & A53(L) & A54(L) & A55(L) \end{bmatrix} \quad (3)$$

$$y(t) = \begin{bmatrix} S(t) \\ V(t) \\ E(t) \\ I(t) \\ F(t) \end{bmatrix} \quad (4) \quad \varepsilon t = \begin{bmatrix} \varepsilon 1(t) \\ \varepsilon 2(t) \\ \varepsilon 3(t) \\ \varepsilon 4(t) \\ \varepsilon 5(t) \end{bmatrix} \quad (5)$$

The "0" entries in $A(L)$ ensure that Emerging Europe stock indices and exchange rates do not affect S&P500, MSCI Europe or VIX both contemporaneously and at lags. As Ülkü (2012) explains, imposing both contemporary and at lags restrictions is essential to avoid spurious transmission effects.

Stock Market and Exchange Rate Interactions in Emerging Europe

Methodology (4)

- **Part 2:** Studying interactions using variance in a SVAR
- Variance modelled with GARCH(1,1), using daily returns
- Variance data used in a structural VAR (SVAR)
- 4 variable setup: variance of S&P500, MSCI Europe, CEE currency pair, CEE stock index
- HQ or SC to choose lag order
- Checked for stability
- Impulse Response Analysis
- Forecast Error Variance Decomposition

Stock Market and Exchange Rate Interactions in Emerging Europe

Methodology (5)

- SVAR analysis followed the methodology described in part 1
- only that the variables are now **variances** of returns of S&P500, MSCI Europe, CEE stock index and CEE exchange rate, and not returns. Also, the SVAR estimated consisted of 4 variables, not 5 (VIX not included).

$$A(L) = \begin{bmatrix} A_{11}(L) & A_{12}(L) & 0 & 0 \\ A_{21}(L) & A_{22}(L) & 0 & 0 \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & A_{34}(L) \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) \end{bmatrix} \quad (6)$$

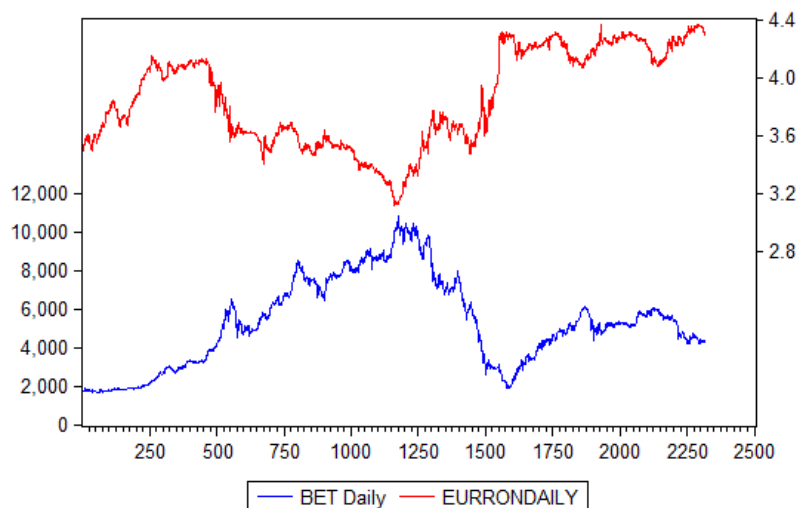
$$y(t) = \begin{bmatrix} SV(t) \\ EV(t) \\ IV(t) \\ FV(t) \end{bmatrix} \quad (7)$$

$$\varepsilon_t = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \\ \varepsilon_3(t) \\ \varepsilon_4(t) \end{bmatrix} \quad (8)$$

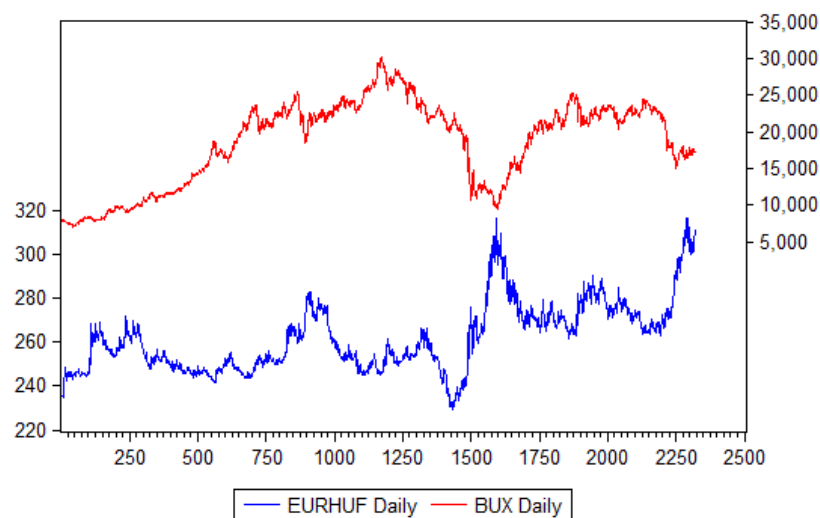
Stock Market and Exchange Rate Interactions in Emerging Europe

Level data

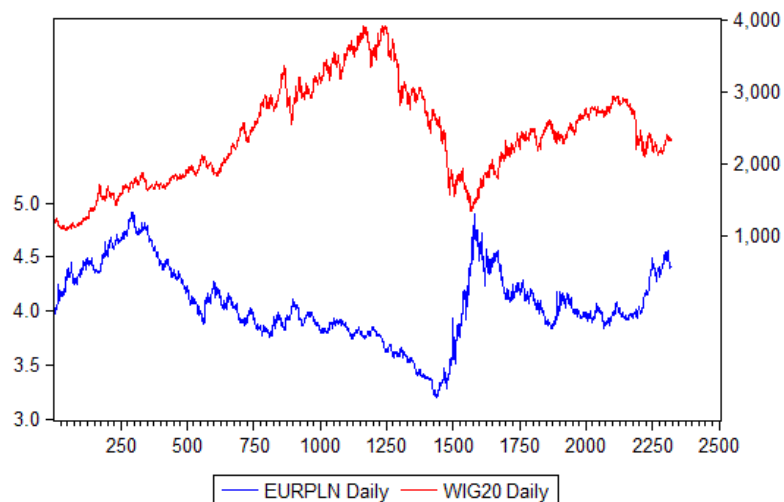
ROMANIA



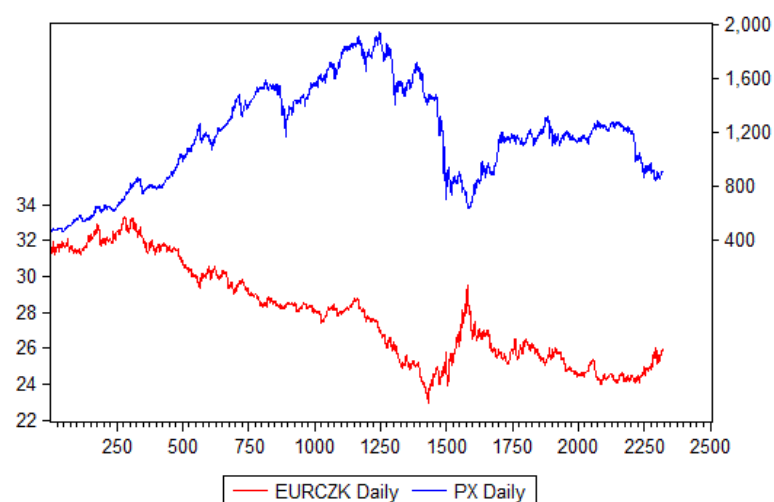
HUNGARY



POLAND



CZECH REPUBLIC



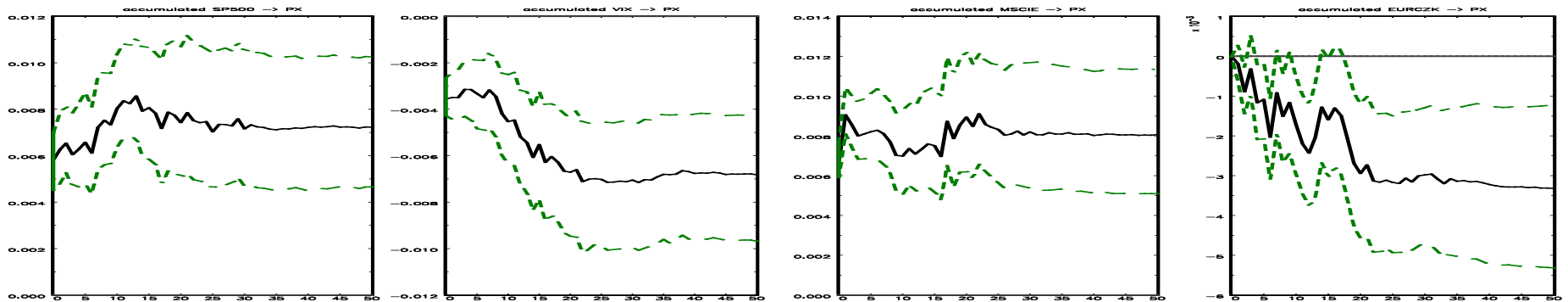
Results. **Daily**. Czech Republic and Hungary Stock Market IRF

Stock market response to
a positive shock in S&P500 is
positive

to VIX is negative

to exchange rate positive shock (currency
depreciation) negative at lags, accumulated
effects added to the negative response

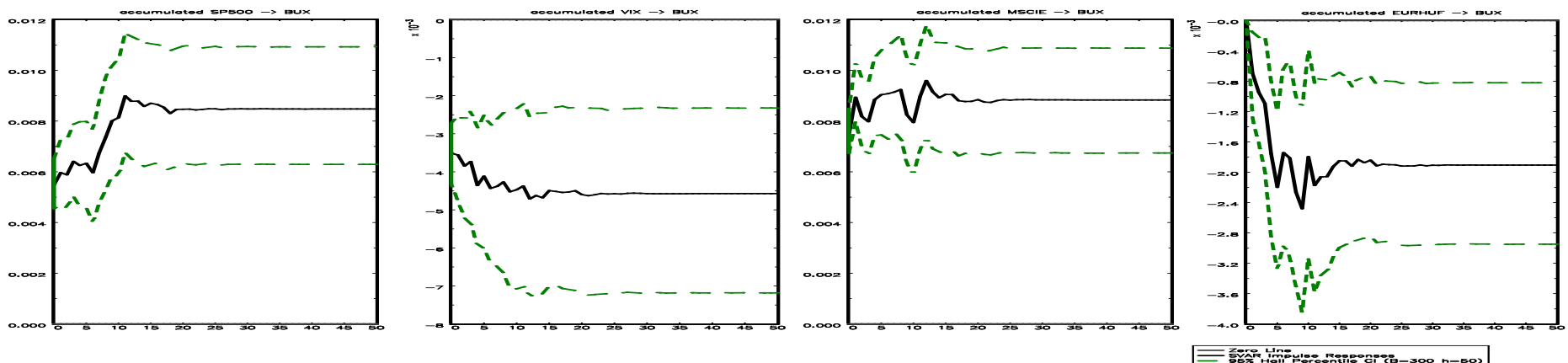
SVAR Impulse Responses



to MSCI Europe: positive, stronger than
response to S&P500

Accumulated PX (top) and BUX (down) response to S&P500, MSCI Europe, VIX
and exchange rate

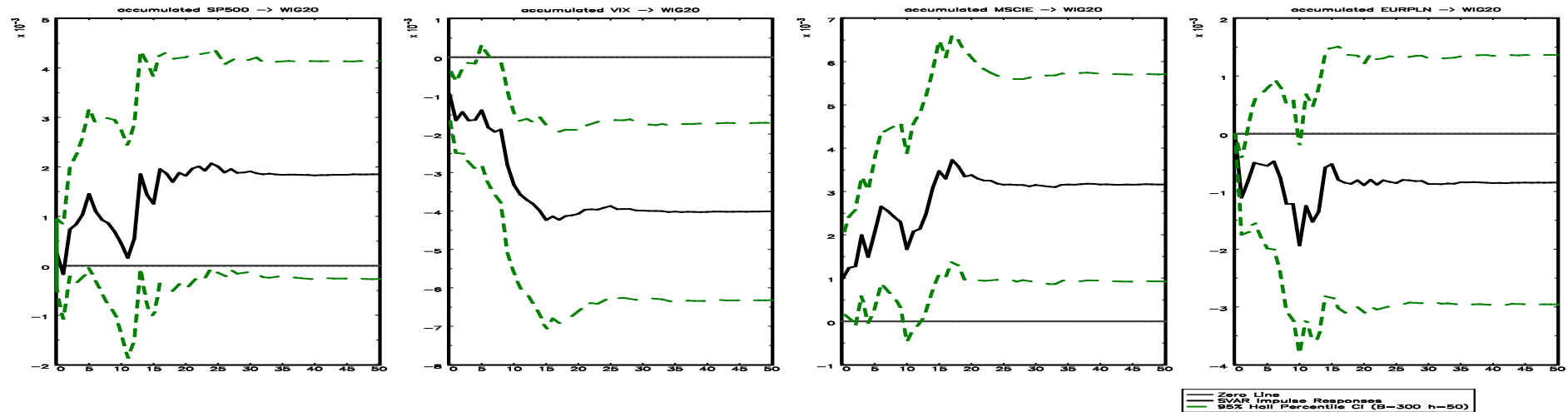
SVAR Impulse Responses



Results. **Daily**. Poland and Romania Stock Market IRF

JMulti Wed Jun 20 14:38:14 2012

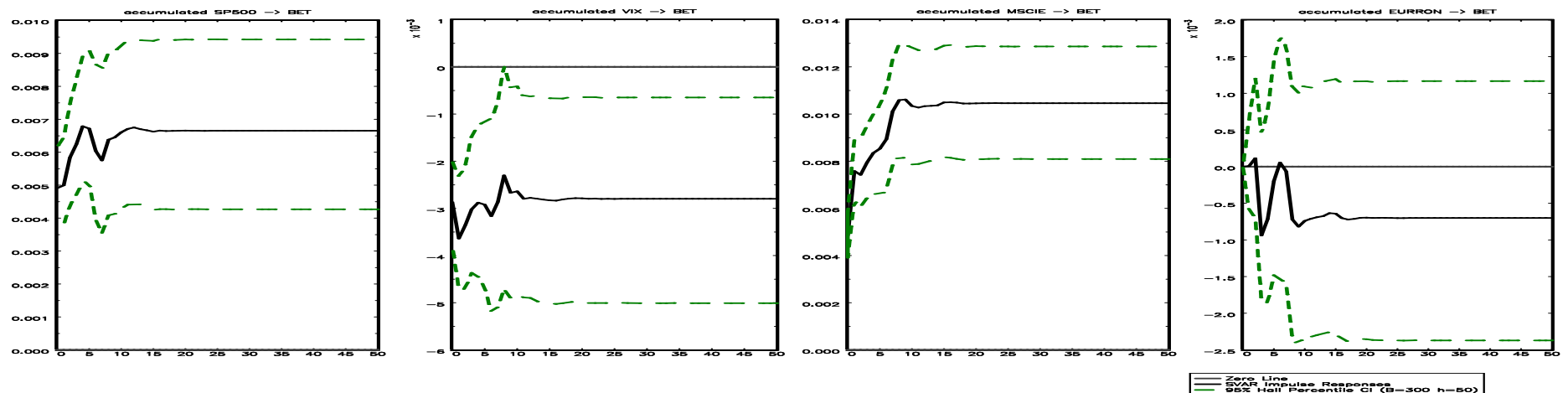
SVAR Impulse Responses



Accumulated WIG20 (top) and BET (down) response to S&P500, MSCI Europe, VIX and exchange rate

JMulti Wed Jun 20 13:05:29 2012

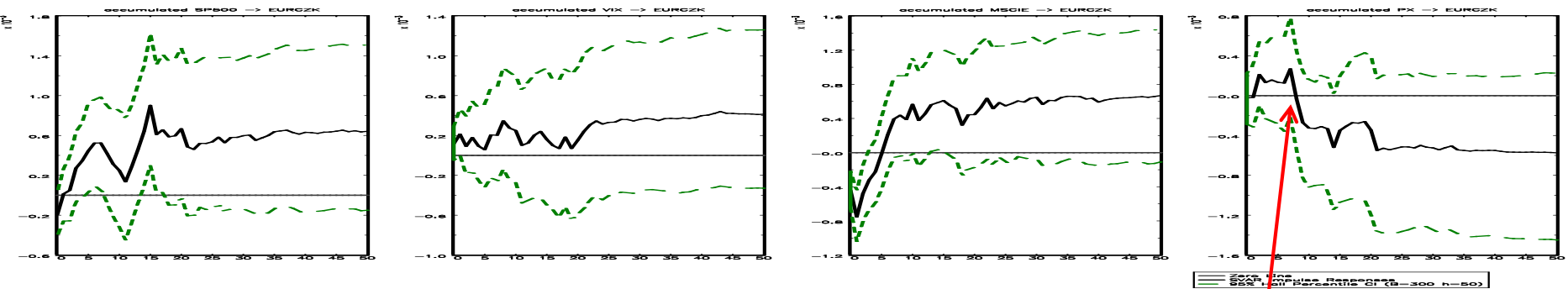
SVAR Impulse Responses



Results. **Daily.** Czech Republic and Hungary Exchange Rate IRF

Exchange rate response to a positive shock in S&P500 and MSCI Europe is negative, implying currency appreciation. In Czech Republic, although the contemporaneous response is negative, it becomes positive at lags (after lag 1 for S&P500 and 5 for MSCI Europe). This may be due to the perceived status of the Czech Koruna (CZK) as a *regional safe haven*.

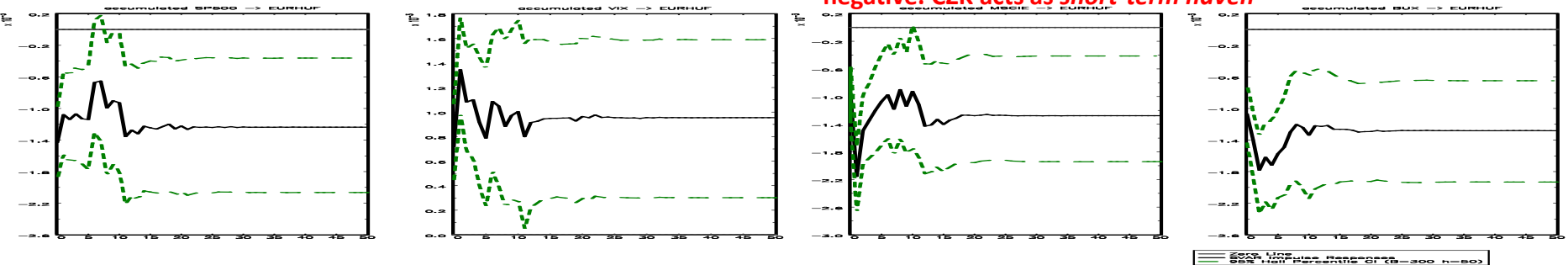
SVAR Impulse Responses



Accumulated EURCZK (top) and EURHUF (down) response to S&P500, MSCI

Europe, VIX and stock market index

The Czech currency falls (EURCZK rises) in response to a stock market shock until lag 10, after which the accumulated response turns negative. CZK acts as *short-term haven*



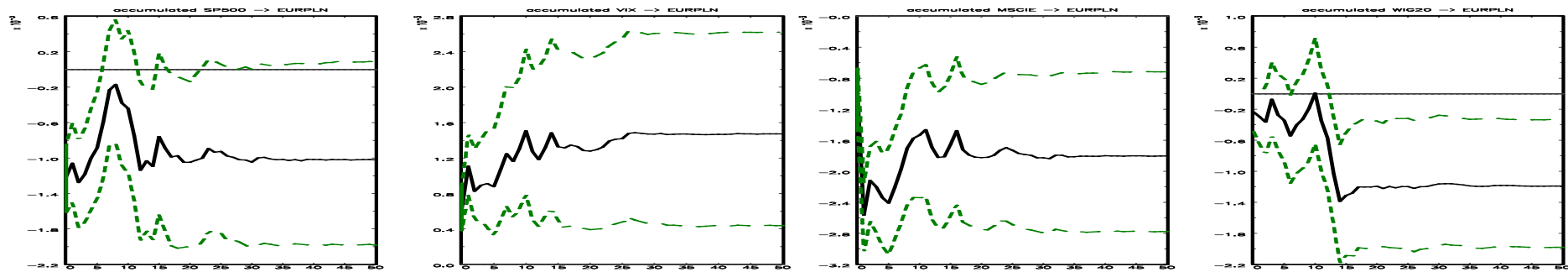
To VIX positive in all countries but not in Czech Republic provides support to the idea that the Czech Republic is viewed as less vulnerable to shocks, being more of a regional safe haven than the other three countries analyzed.

Results. Daily. Poland and Romania Exchange Rate IRF

Response to the stock market is generally negative with accumulated effects.

JMulti Wed Jun 20 14:37:43 2012

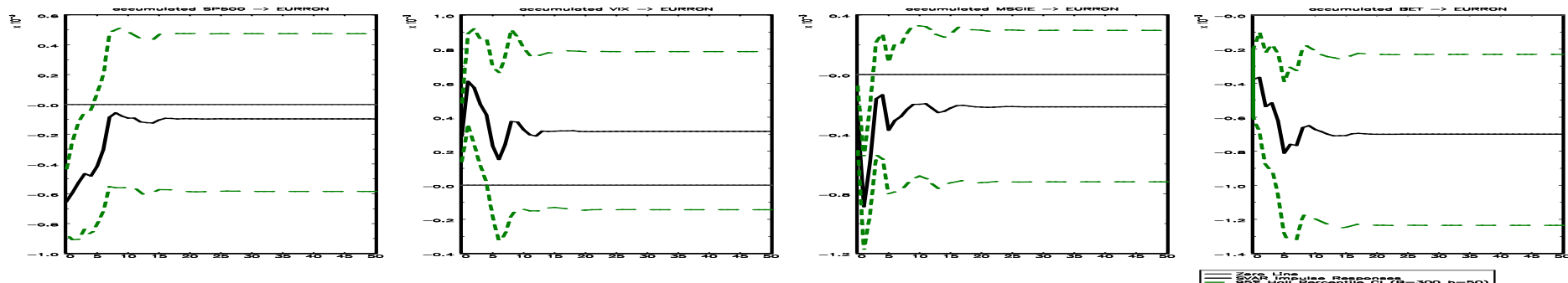
SVAR Impulse Responses



Accumulated EURPLN (top) and EURRON (down) response to S&P500, MSCI Europe, VIX and stock market index

JMulti Wed Jun 20 13:17:34 2012

SVAR Impulse Responses

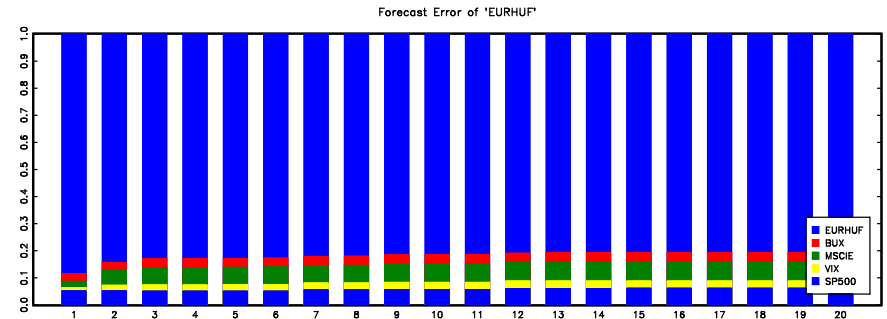
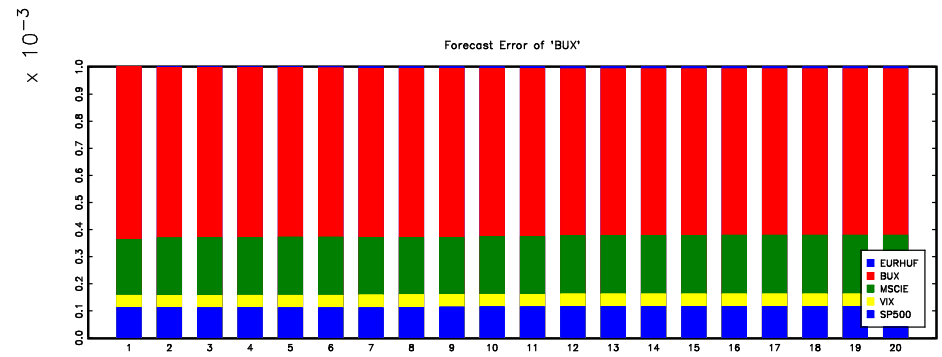
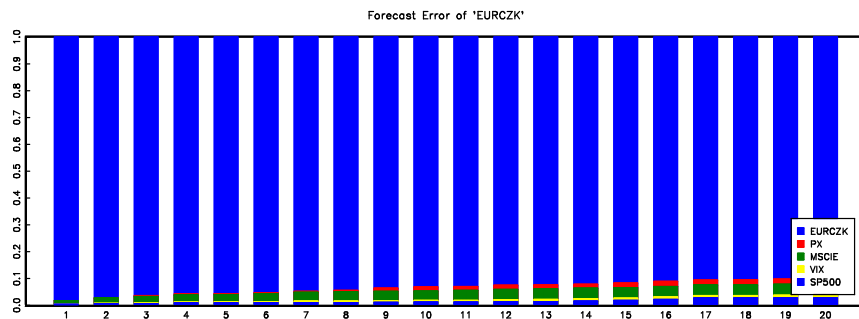
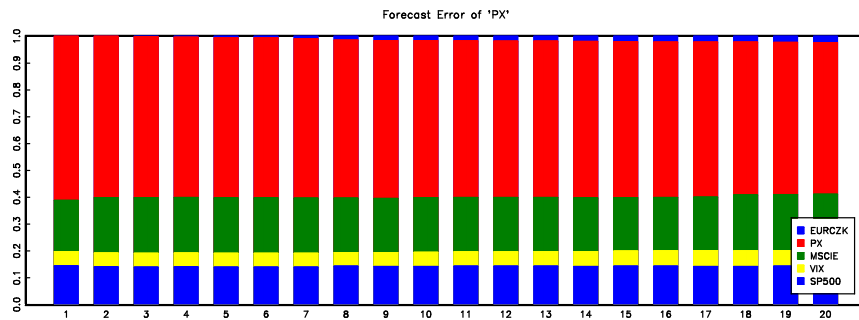


Results. **Daily**. Czech Republic and Hungary Variance Decomposition

PX *BUX*
EURCZK *EURHUF*

Forecast Error Variance Decomposition (FEVD)

Forecast Error Variance Decomposition (FEVD)

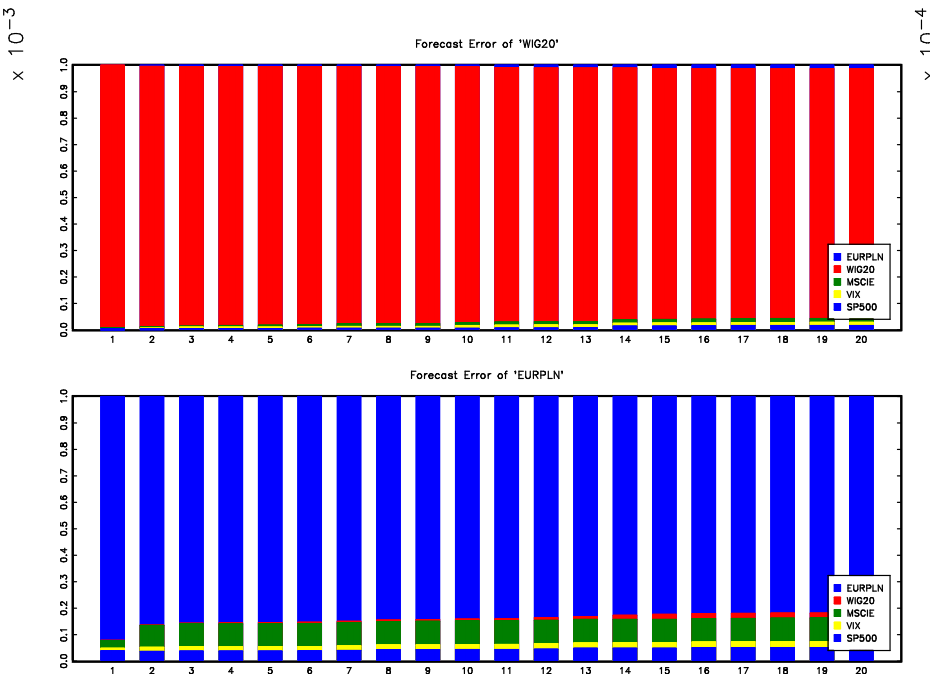


The forecast error variance decomposition for Czech Republic and Hungary shows that in explaining the **stock market** the European MSCI Europe index and US S&P500 are significant, but MSCI Europe is more important, followed by S&P500 and the VIX. All three global factors are more important than the local exchange rate. In explaining the **exchange rate** MSCI Europe is the most important factor (except for the own variable). VIX and local stock market lag behind S&P500 in importance to accounting for exchange rate's dynamics.

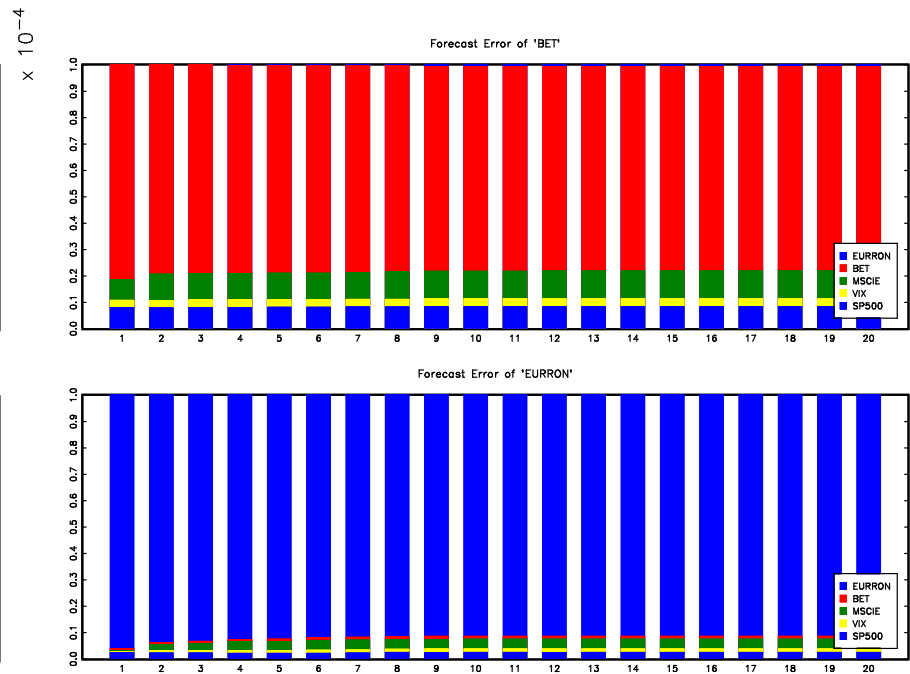
Results. **Daily**. Poland and Romania. Variance Decomposition

WIG20 *BET*
EURPLN *EURRON*

Forecast Error Variance Decomposition (FEVD)



Forecast Error Variance Decomposition (FEVD)



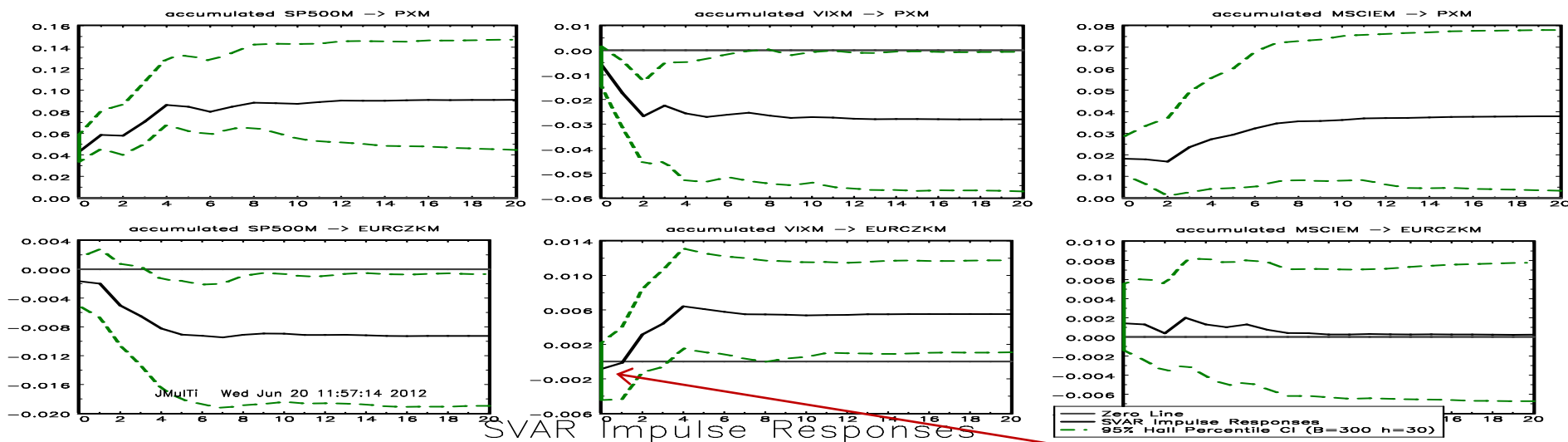
Poland follows the same ordering of relative importance in decomposing WIG20 forecast error variance, yet proportions for all factors (except stock index's own influence) are much smaller than in Hungary and Czech Republic. Romania is closer to Czech Republic than to Poland in what concerns variance decomposition interpretation of BET. While MSCI Europe and S&P500 appear to be more important in explaining BET than VIX and EURRON, the percentages of error variance due to these two stock indices are lower than in the case of Czech Republic and Hungary.

Results. Monthly. Czech Republic Stock Market and Exchange Rate IRF

JMULTI Wed Jun 20 11:54:53 2012

SVAR Impulse Responses

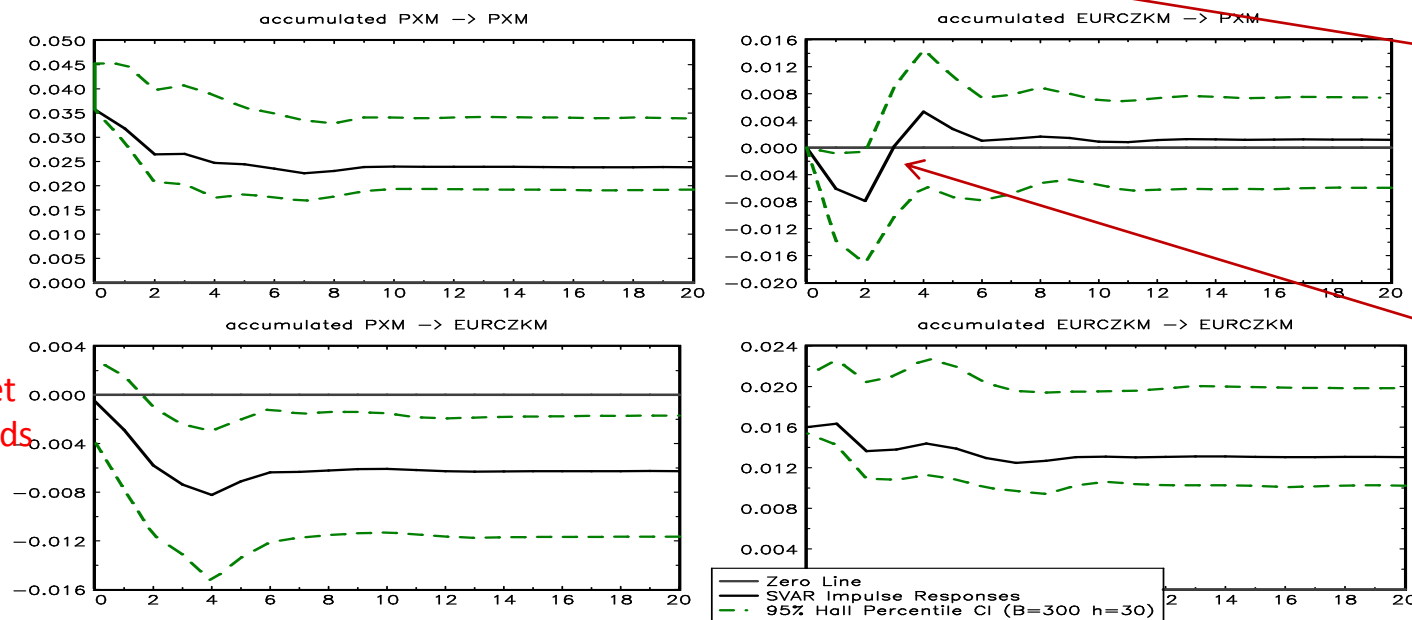
"normal" behaviour of EURCZK at lags



Stock market increase leads to CZK rise

EURCZK contemporaneous response to VIX is negative

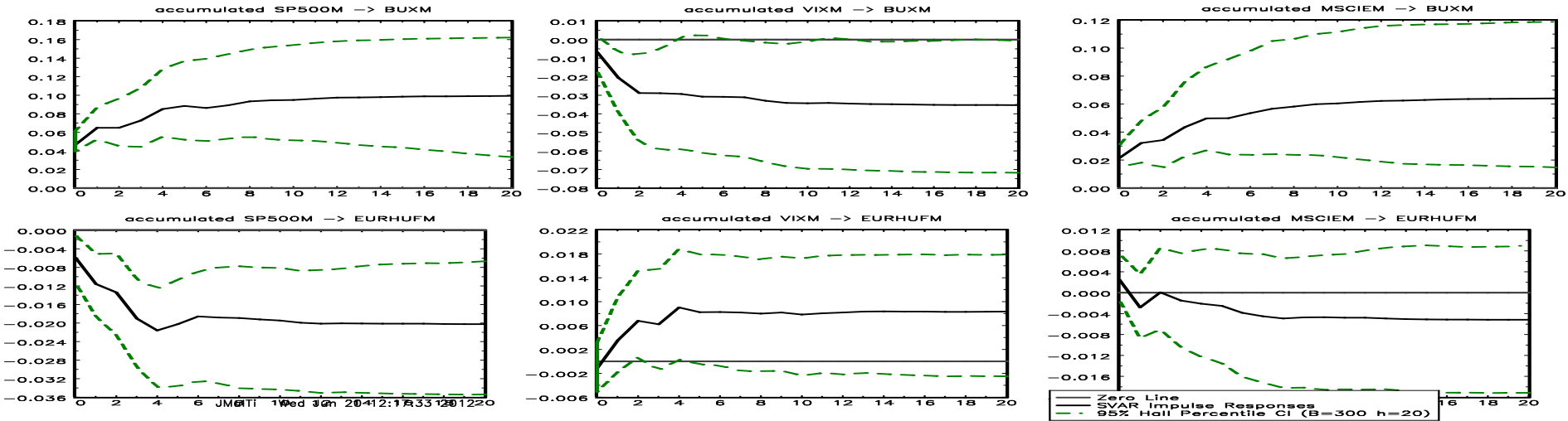
EURCZK rise is first negative, then becomes a positive factor for stock market after lag 3



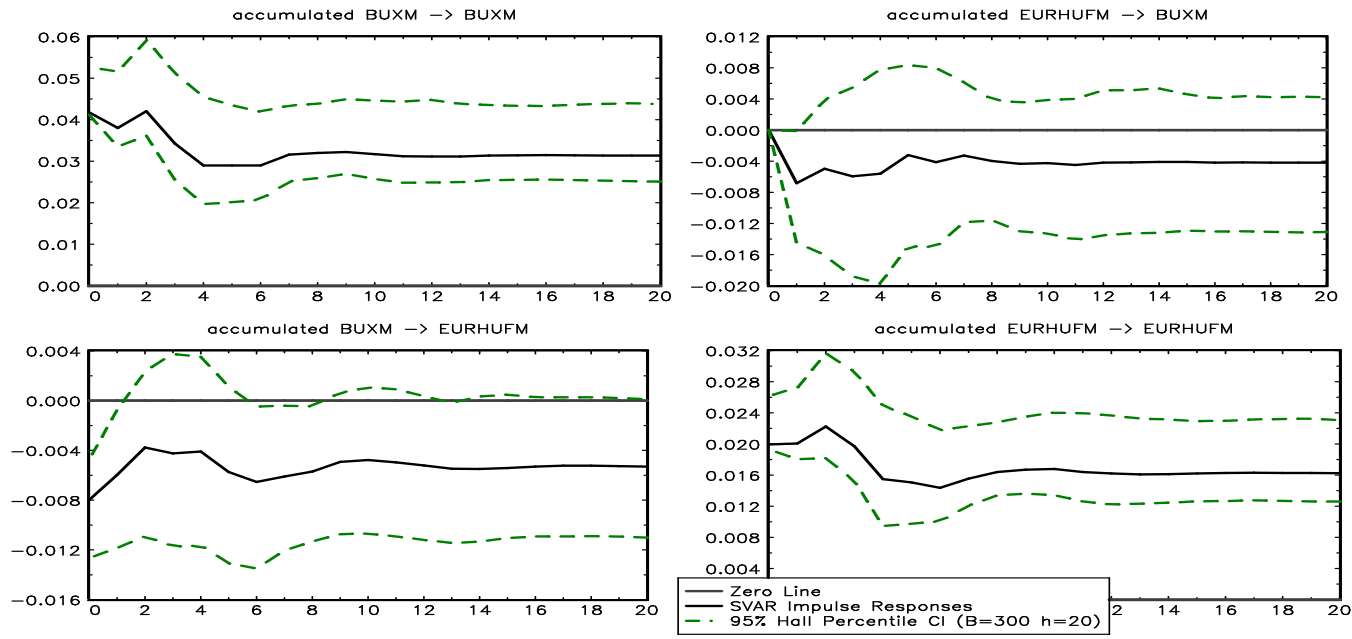
Results. Monthly. Hungary Stock market and Exchange Rate IRF

JMULTI Wed Jun 20 12:16:34 2012

SVAR Impulse Responses



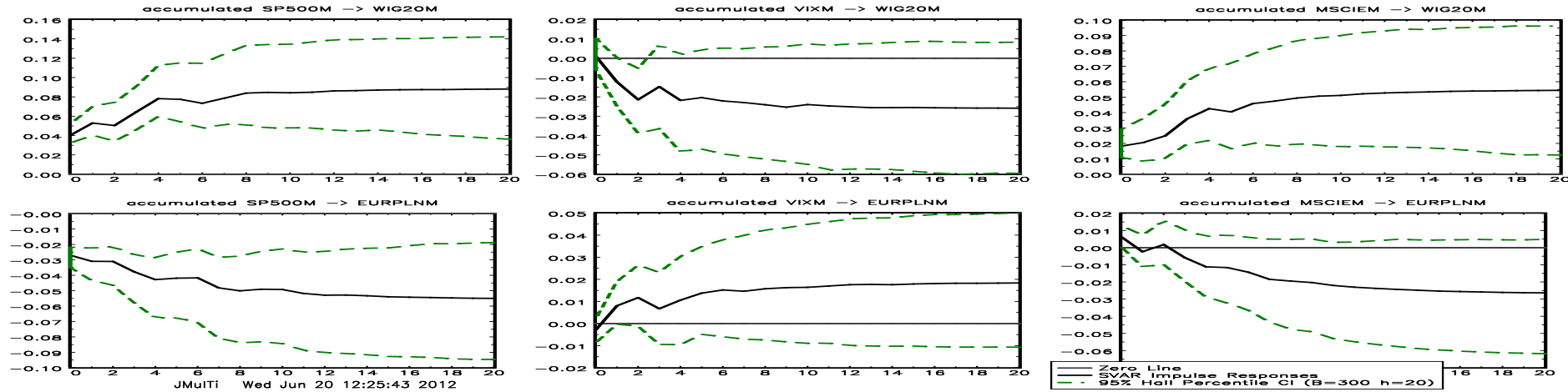
SVAR Impulse Responses



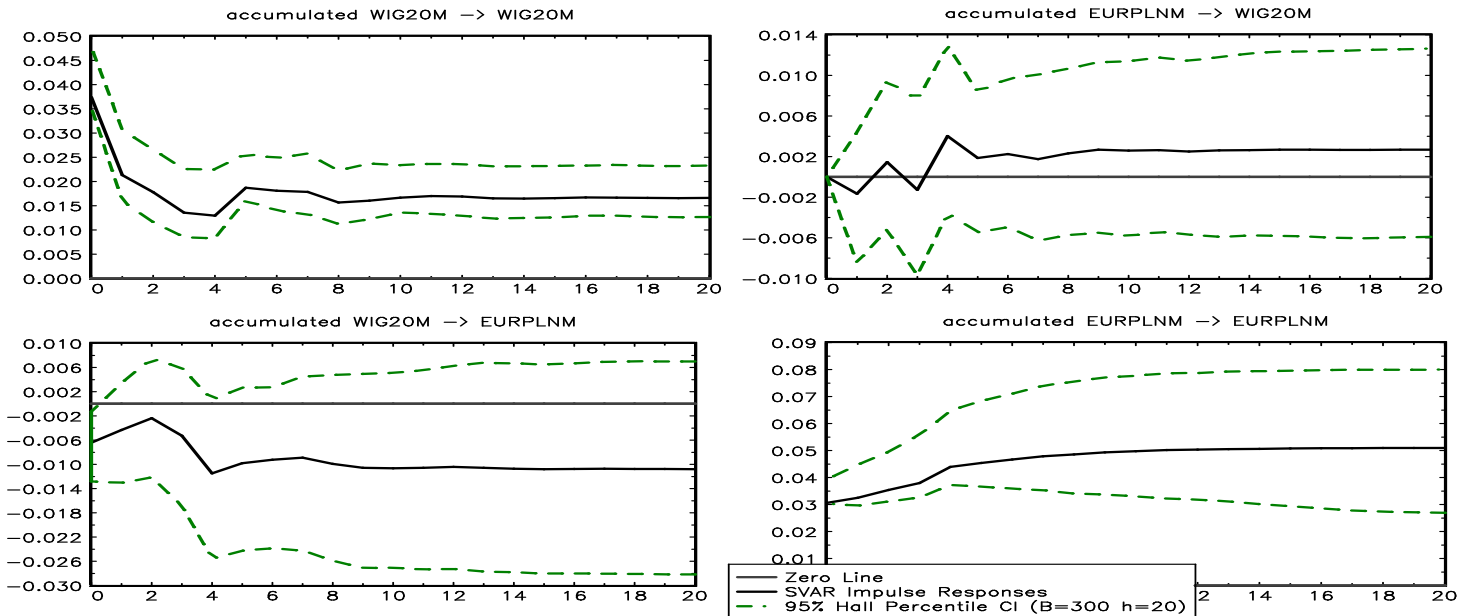
Results. Monthly. Poland Exchange Rate and Stock Market IRF

JMuTI Wed Jun 20 12:25:30 2012

SVAR Impulse Responses



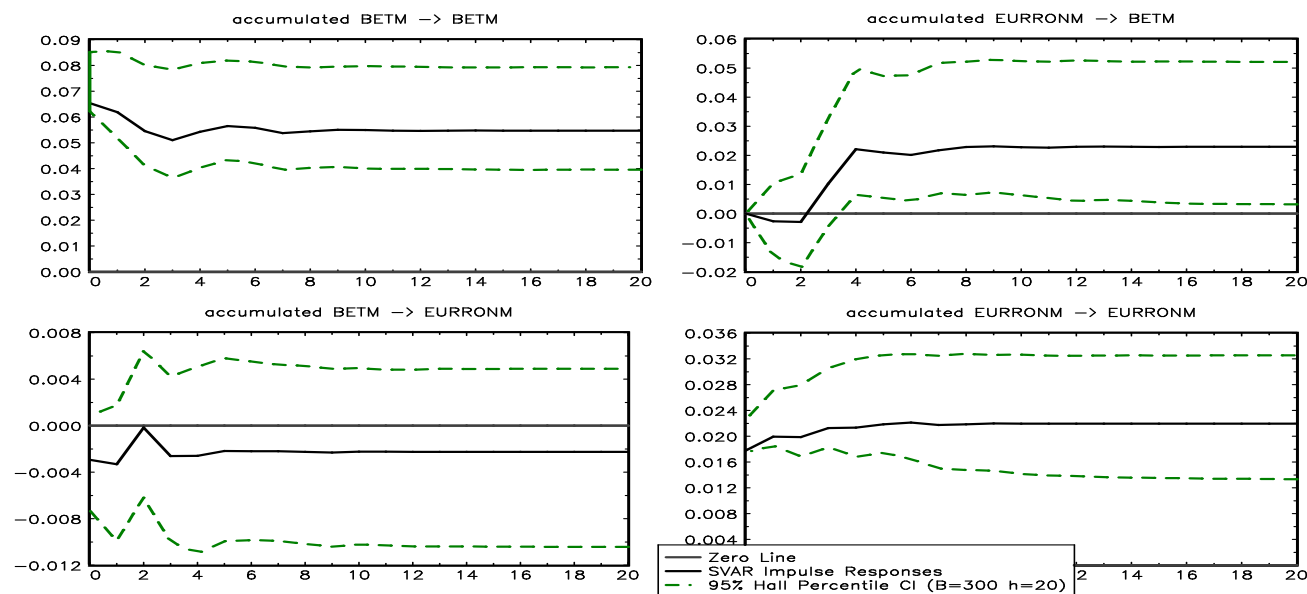
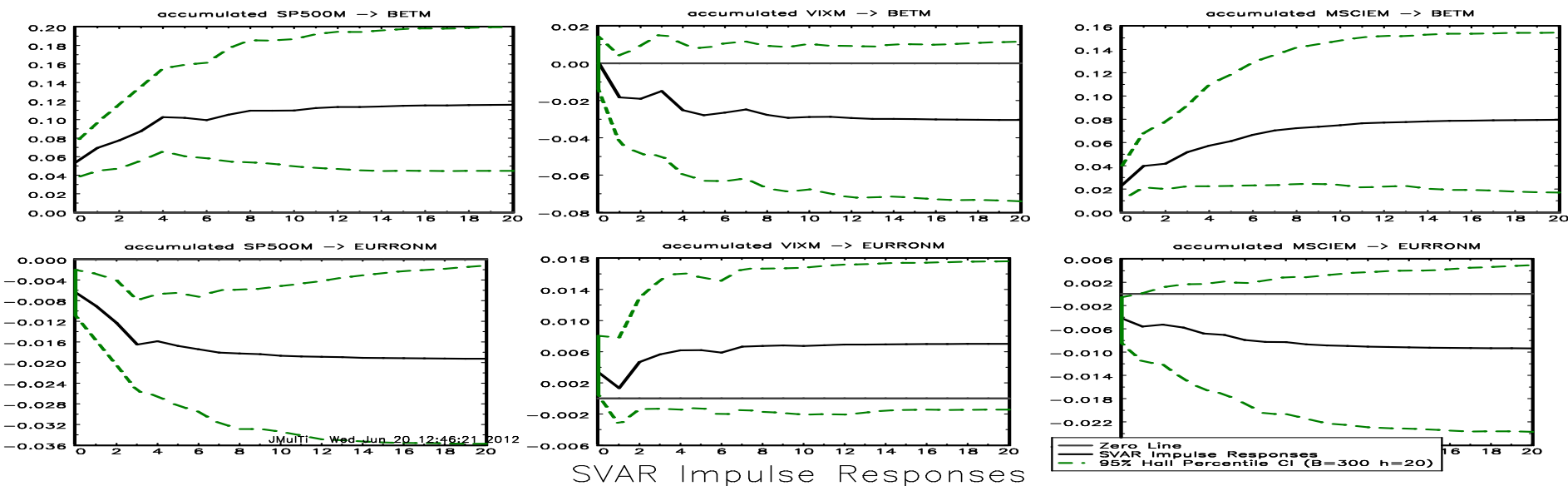
SVAR Impulse Responses



Results. Monthly. Romania Exchange Rate IRF

JMulti Wed Jun 20 12:46:02 2012

SVAR Impulse Responses



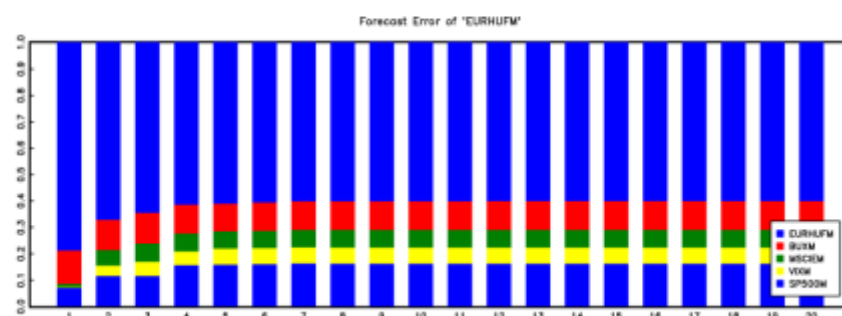
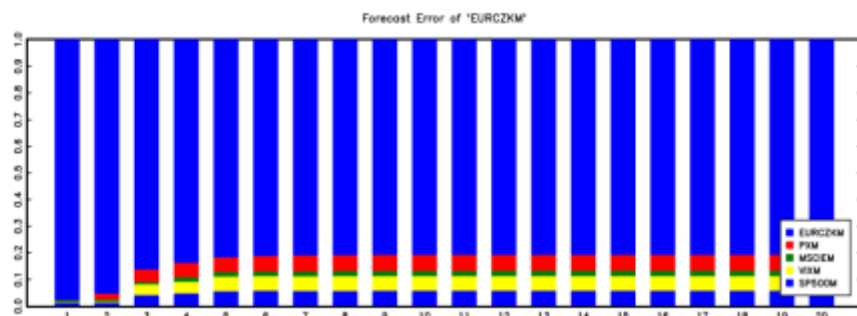
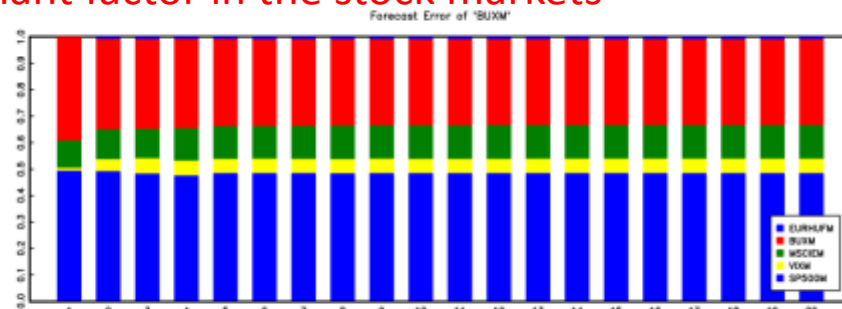
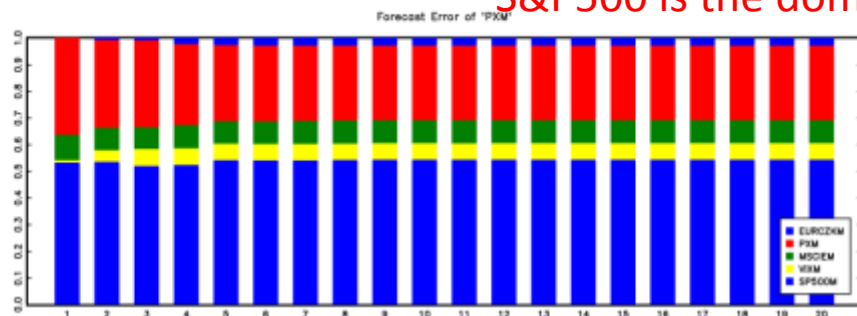
Results. Monthly. Czech Republic and Hungary Variance Decomposition

PX *BUX*
EURCZK *EURHUF*

Forecast Error Variance Decomposition (FEVD)

Forecast Error Variance Decomposition (FEVD)

S&P500 is the dominant factor in the stock markets



The S&P500 accounts for most of the EURPLN exchange rate moves, after EURPLN itself. The proportion falls to 7 - 16% for EURRON and EURHUF, and just 1 - 6% in EURCZK. VIX becomes increasingly important at lags, reaching 5% in EURCZK, 6% in EURHUF and EURRON and 8% in EURPLN over 10 months. The local stock market accounts for just 0 - 6% in Czech Republic, 10 - 13% in Hungary, 2 - 4% in Poland and 2 - 5% in Romania. MSCI Europe accounts for a minor 1-2% of the exchange rate dynamic in Czech Republic, 4-5% in Romania, 1-7% in Hungary and 2-10% in Poland.

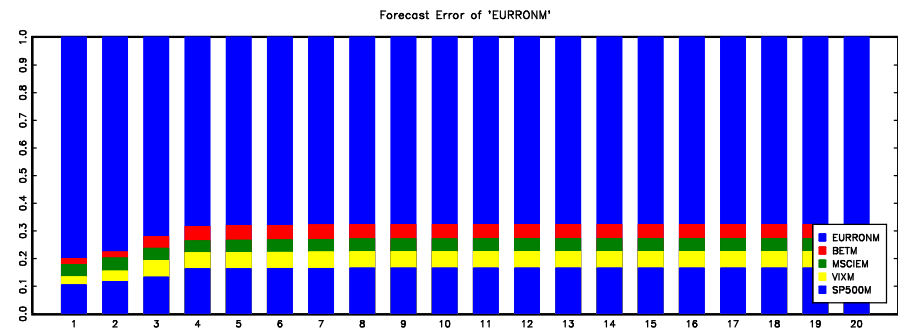
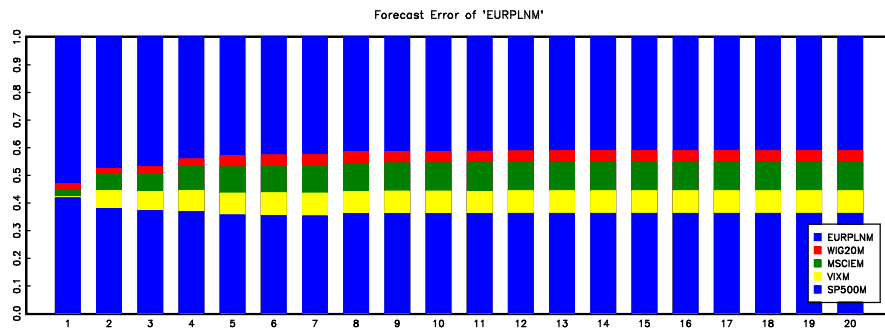
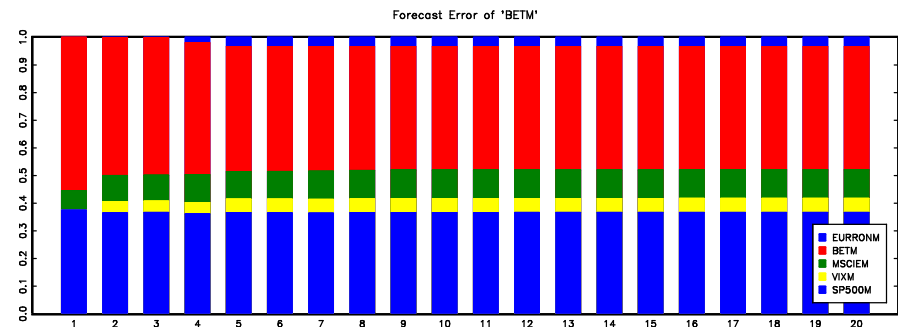
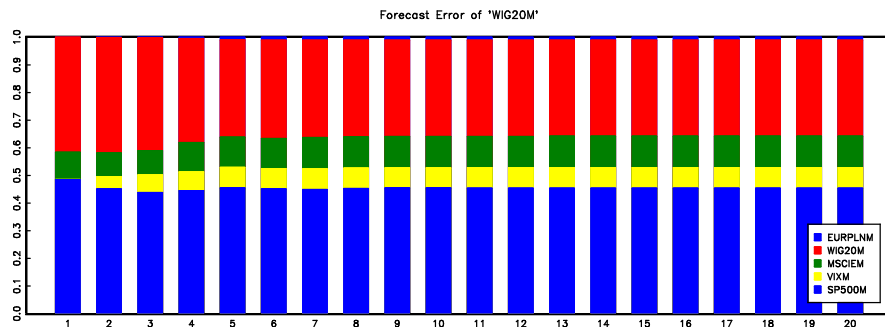
Results. **Monthly**. Poland and Romania. Variance Decomposition

WIG20 *BET*
EURPLN *EURRON*

Forecast Error Variance Decomposition (FEVD)

Forecast Error Variance Decomposition (FEVD)

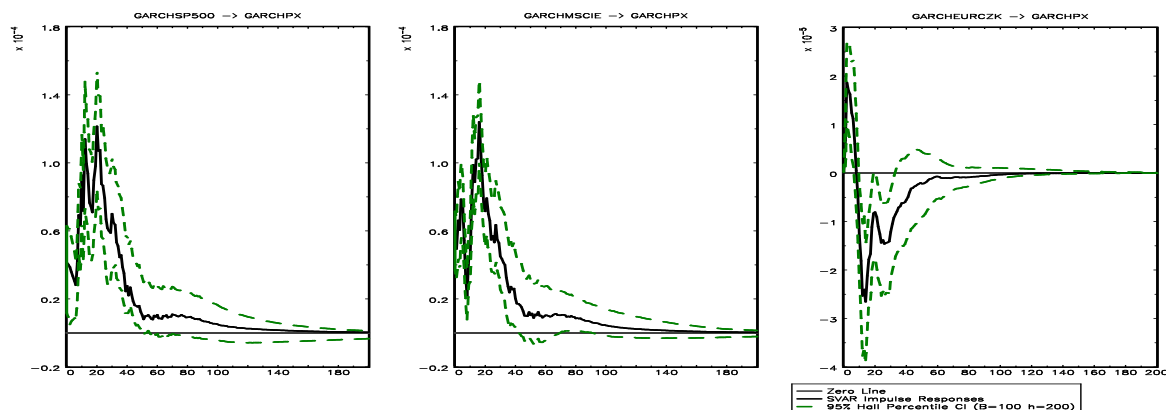
S&P500 is first in Poland in the stock market FEVD, but in Romania BET retains pole position



Results. Variance Interactions. Czech Republic and Hungary Stock Market IRF

JMulti Fri Jun 22 11:37:50 2012

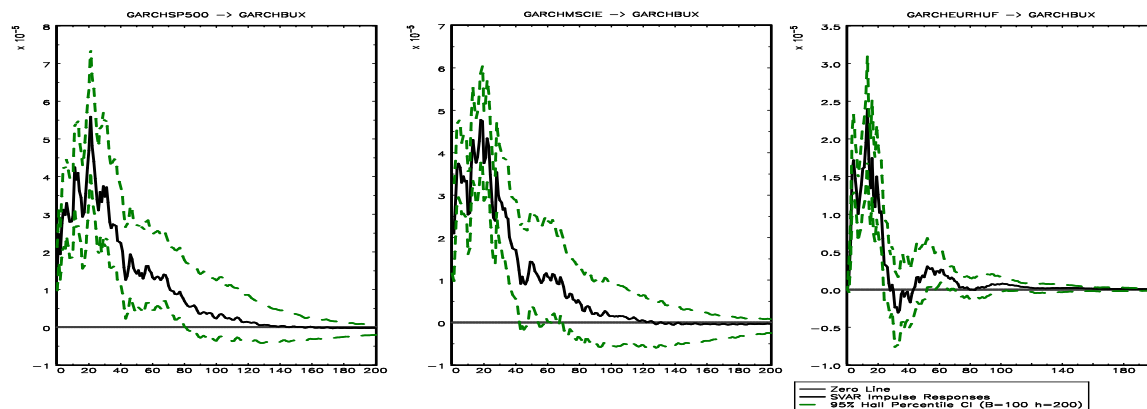
SVAR Impulse Responses



PX variance (top) and BUX variance (down) response to S&P500, MSCI Europe and exchange rate variance

JMulti Fri Jun 22 10:39:18 2012

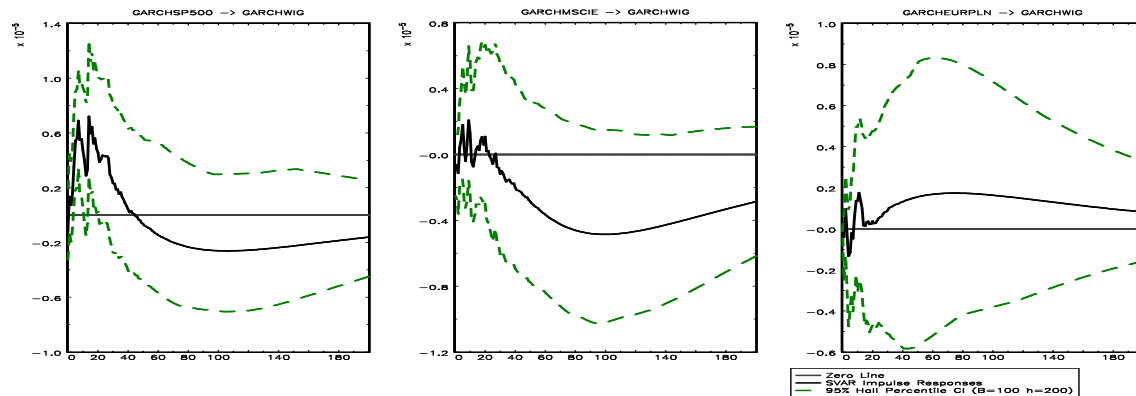
SVAR Impulse Responses



Results. Variance Interactions. Poland and Romania Stock Market IRF

JMulti Fri Jun 22 09:07:22 2012

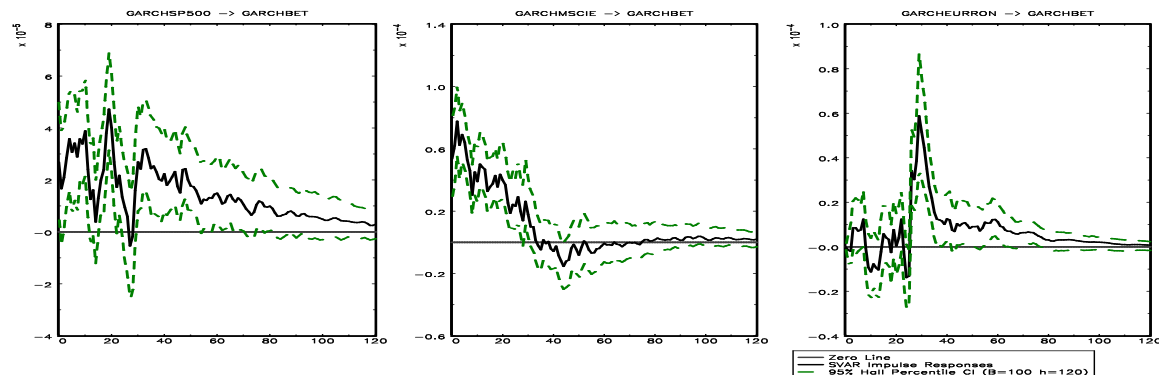
SVAR Impulse Responses



WIG20 variance (top) and BET variance (down) response to S&P500, MSCI Europe and exchange rate variance

JMulti Thu Jun 21 21:46:07 2012

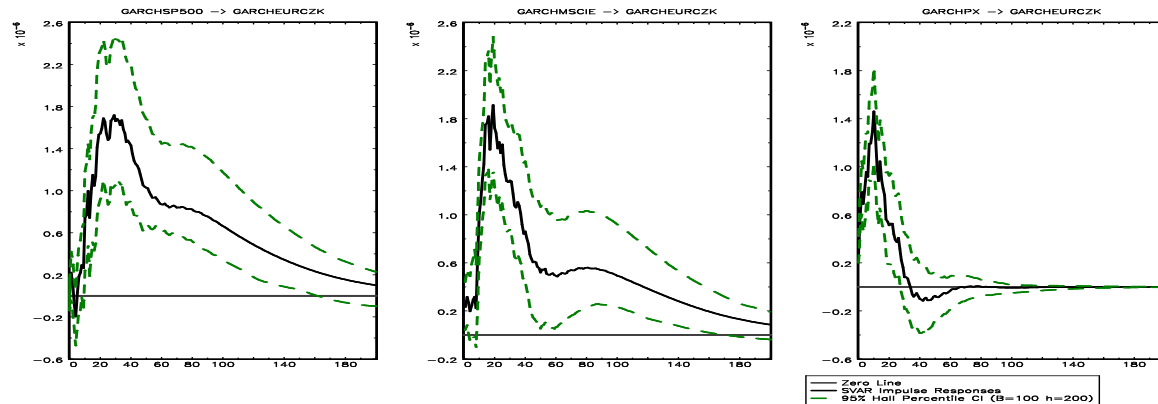
SVAR Impulse Responses



Results. Variance Interactions. Czech Republic and Hungary Exchange Rate IRF

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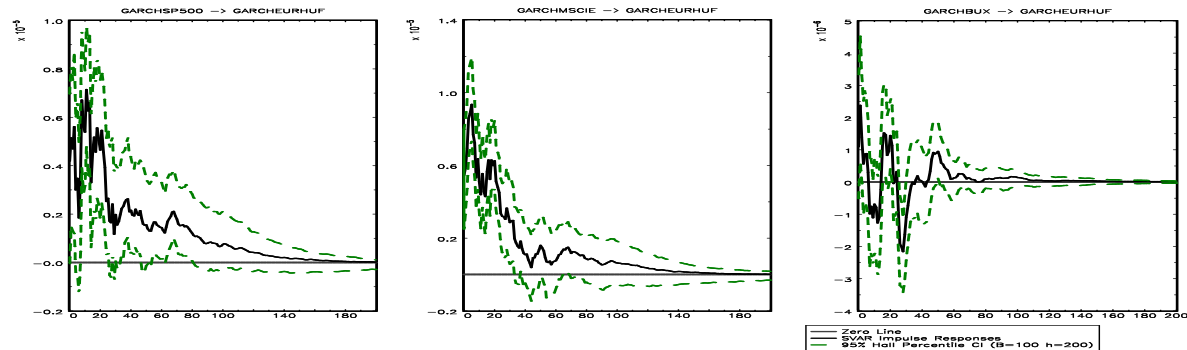
SVAR Impulse Responses



EURCZK variance (top) and EURHUF variance (down) response to S&P500, MSCI Europe and stock market index variance

JMulti Fri Jun 22 10:39:49 2012

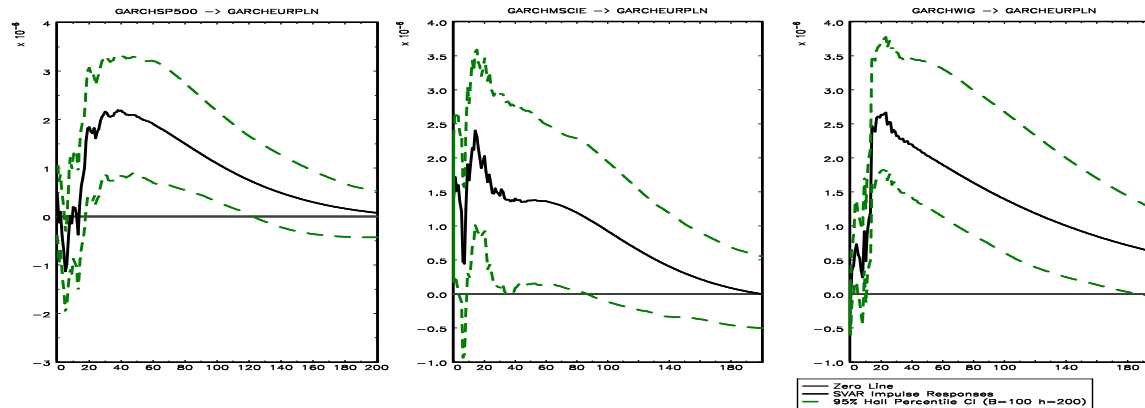
SVAR Impulse Responses



Results. Variance Interactions. Poland and Romania Exchange Rate IRF

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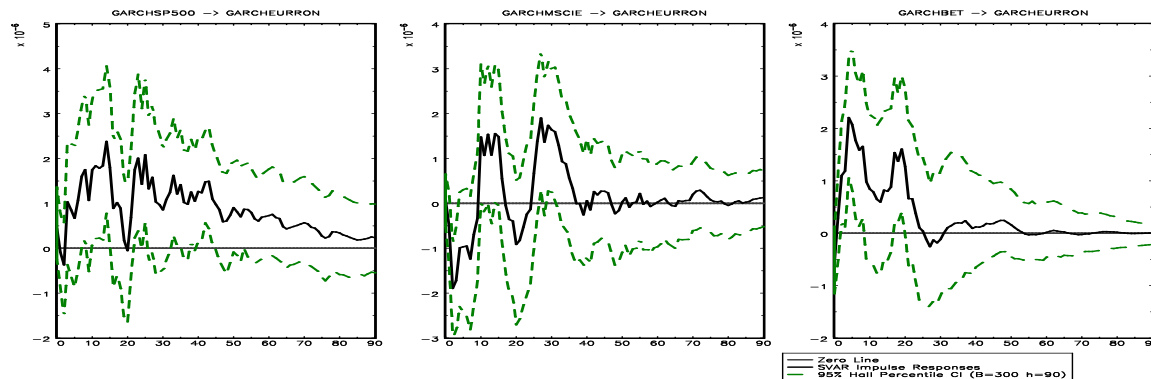
SVAR Impulse Responses



EURPLN variance (top) and EURRON variance (down) response to S&P500, MSCI Europe and stock market index variance

JMulti Thu Jun 21 20:53:39 2012

SVAR Impulse Responses



Results. Variance Interactions. Czech Republic and Hungary

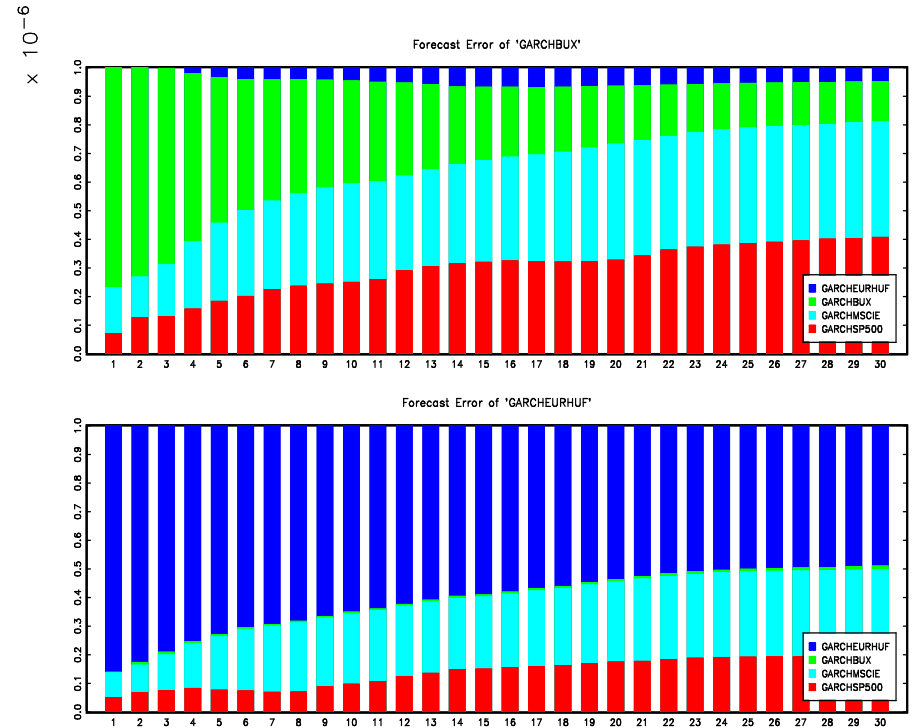
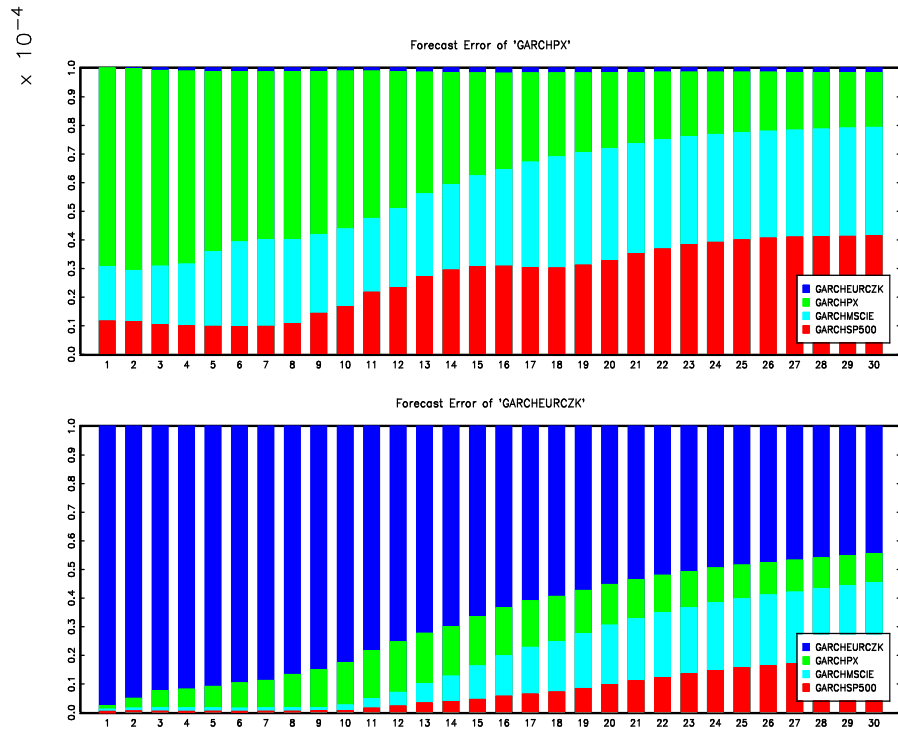
Variance Decomposition

PX
EURCZK

Forecast Error Variance Decomposition (FEVD)

BUX
EURHUF

Forecast Error Variance Decomposition (FEVD)



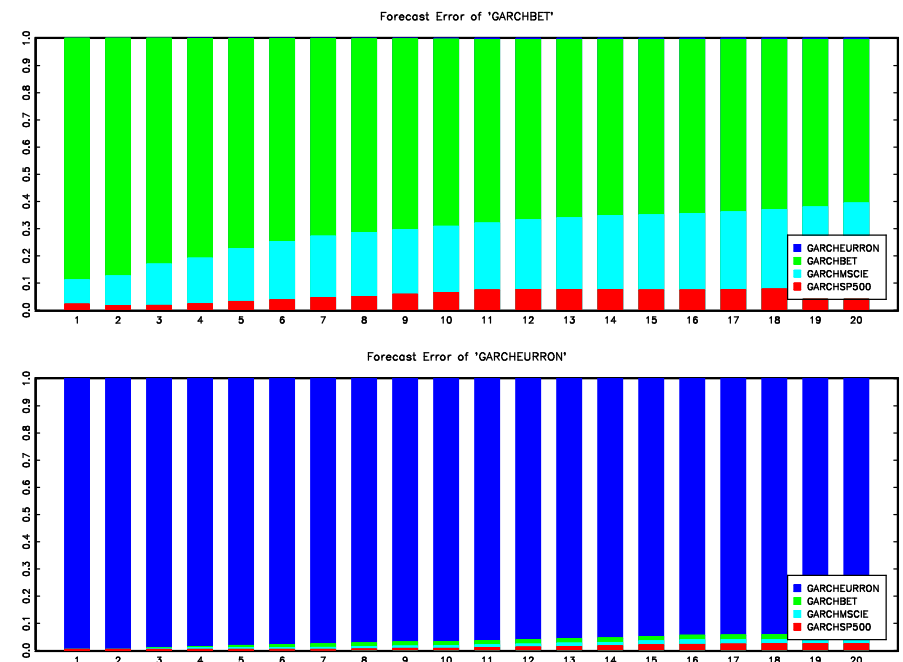
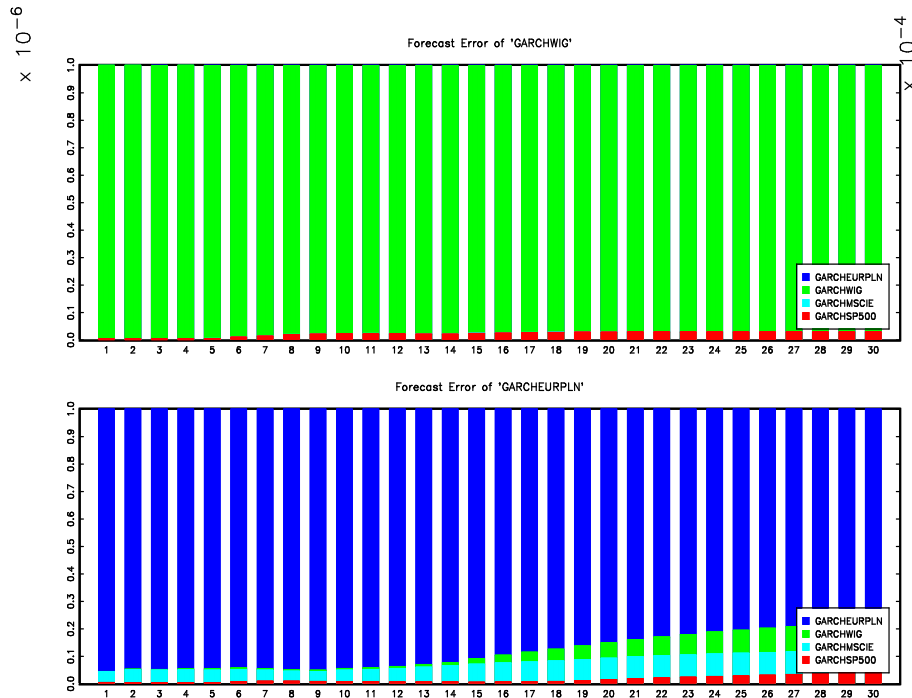
S&P500 and MSCI Europe variance become increasingly important at lags, especially in the stock market FEV

Results. Variance Interactions. Poland and Romania. Variance Decomposition

WIG20 *BET*
EURPLN *EURRON*

Forecast Error Variance Decomposition (FEVD)

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Poland is different again, appearing more isolated ref. stock market variance decompositions. Romania exchange rate is modestly explained by global factors

Stock Market and Exchange Rate Interactions in Emerging Europe

Results (1)

- **Stock market response to**
 - a positive shock in S&P500 is positive
 - MSCI Europe: positive, stronger than response to S&P500
 - VIX was negative, and accumulated effects increased until lag 20 in Czech Republic and Poland, and 15 in Hungary
 - exchange rate positive shock (currency depreciation) was negative at lags, yet not significant in Romania. Accumulated effects added to the negative response until lag 25 in Czech Republic, 15 in Hungary and Romania, 20 in Poland
- **Exchange rate response to**
 - a positive shock in S&P500 and MSCI Europe is negative, implying currency appreciation in Hungary, Poland. In Romania the response was not significant. In Czech Republic, although the contemporaneous response is negative, it becomes positive at lags (after lag 1 for S&P500 and 5 for MSCI Europe). This may be due to the perceived status of the Czech Koruna (CZK) as a *regional safe haven*.
 - VIX positive in all countries but not in Czech Republic provides support to the idea that the Czech Republic is viewed as less vulnerable to shocks, being more of a regional safe haven than the other three countries analyzed.
 - the stock market is negative with accumulated effects The Czech currency falls (EURCZK rises) in response to a stock market shock until lag 10, after which the accumulated response turns negative. Again this can be determined by the special case of the CZK status: an improvement in the stock market reflects better conditions that reduce the need for protection. However over longer periods, EURCZK reacts negatively (CZK appreciates) to a stock market shock, just like the rest of EE countries analyzed.

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Results (2)

In explaining the stock market dynamic at the daily frequency the European MSCI Europe index and US S&P500 are significant, MSCI Europe being more important. MSCI Europe and S&P500 are more useful than VIX. All three global factors are more important than the local exchange rate. In Poland proportions for all factors (except stock index's own influence) are much smaller than in Hungary and Czech Republic. Romania is closer to Czech Republic than to Poland in what concerns variance decomposition interpretation of BET.

In explaining the exchange rate movement at the daily frequency MSCI Europe is the most important factor (except for the own variable) in all countries. VIX and local stock market lag behind S&P500 in importance to accounting for exchange rate's dynamics.

Stock Market and Exchange Rate Interactions in Emerging Europe

Results (3)

- At the **monthly** frequency using returns there is more uniformity than in the daily data
- **Stock market response** to
 - a positive shock in S&P500 was positive. Contemporaneous response is positive, and accumulated response increases before stabilizing around lag 8 for each country.
 - MSCI Europe is positive in all countries following the same shape, but this time weaker than the response to S&P500.
 - VIX was negative (weak contemporaneous response in Poland and Romania), and accumulated effects increased until around lag 10.
 - an exchange rate positive shock (currency depreciation) was negative at first, turning positive after lag 3 in Czech Republic, after lag 2 in Romania and was decisively positive after lag 4 in Poland while it remained negative in Hungary. We may presume that the short-term negative effect is due to global investors reacting negatively and selling both local currency and shares, while at lags the positive macroeconomic effect of a cheaper currencies on the exports and then on the stock market becomes apparent.
- **Exchange rate response** to
 - a positive shock in S&P500 and MSCI Europe was negative, implying currency appreciation. The behaviour of EURCZK was similar to the other countries, implying that the Czech Koruna (CZK) is only a **short-term regional safe haven**.
 - VIX was positive in all countries (negative only contemporaneously in EURCZK, sustaining the CZK **short-term** regional safe have theory). When investors expect increased volatility on the US market, they decide to reduce their exposure on Emerging Europe currencies
 - stock market index is negative with accumulated effects increasing until lag 4 in the Czech Republic and stabilizing after lag 8 in Hungary and Poland and lag 5 in Romania.

Stock Market and Exchange Rate Interactions in Emerging Europe

Results (4)

- At the **monthly** frequency variance decomposition shows major differences from the daily frequency
- S&P500 explains approximately half of the movement in the EE stock market indices, with the exception of Romania, where it is at more than one third.
 - MSCI Europe comes second
 - VIX is third. VIX generally has an expanding influence with the forecast horizon
- Local currency value accounts for a marginal proportion only of the stock market movement (between 0 and 3%). The US stock index acts as a global proxy for international investor demand, essential for determining the flows to and from the EE stock markets. It may also point to macroeconomic information content reflected then by EE stock markets.

Stock Market and Exchange Rate Interactions in Emerging Europe

Results (5)

- A shock in the variance of S&P500 and MSCI Europe produces a response in the Czech republic stock market variance that reaches a high just after lag 20, quickly decaying for 20 more lags before slowly decaying afterwards. A similar pattern takes place in Hungary. In Poland the initial response is weaker, and turns negative with a low after lag 90.
- A shock in the variance of S&P500 and MSCI Europe produces a rise in the variance (and thus the volatility) of the exchange rate in all countries. There is a quick decay in the EURCZK variance after lag 35 for S&P500 response and 25 for MSCI Europe response, and a slower decay after lag 80. The pattern is somewhat similar in Hungary, yet in Poland the decay appears after lag 40. Romania is prone to whipsawing, with the variance of EURRON not significantly impacted after lag 100 for a S&P500 shock and after lag 50 for a MSCI Europe variance shock.
- In the Czech Republic, a shock in EURCZK variance is translated into a very short term variance response that is followed by a more "silent" period around lag 18. Variance shocks decay almost entirely after lag 80. A shock in PX variance leads to a positive response in EURCZK variance that quickly decays over the next 20 lags. In Hungary the pattern is similar, but with more muted "silence" period and a whipsawing response of EURHUF variance to BUX variance shock over the first 60 lags. In Poland, the short-term response of WIG20 variance to a EURPLN variance shock is mixed in the first 20 lags, becomes positive and decays slowly after lag 70. The EURPLN rate variance is impacted by a shock in WIG20 variance that reaches a high around lag 20 and then slowly decays.

Stock Market and Exchange Rate Interactions in Emerging Europe

Results (6)

- S&P500 and MSCI Europe variances explain an increasing portion of PX (Czech stock market index) variance, becoming dominant after lag 12 and explaining together more than 2/3 of the movement in PX after lag 20. The EURCZK rate accounts for just 0 - 2%. In Hungary S&P500 and MSCI Europe variance accounts for more than half of BUX variance after lag 6 while EURCZK explains 0 - 5% of BUX. In Poland however there is only minor accounting for the variance of WIG20 by the variance of S&P500 (0 - 5%) while MSCI Europe and EURPLN variance do not appear to matter. In Romania, MSCI Europe variance is far more important than S&P500 in explaining BET variance (9-30% and 0 - 9% respectively). In Romania, the high of the BET variance response to shock in EURRON variance is reached after lag 30 with a fast decay after. BET variance shock leads to a EURRON variance response with a high reached after 6 lags, that becomes less important after lag 50.
- Exchange rate variance gets increasingly explained by S&P500 and MSCI Europe variance in Hungary and Czech Republic, accounting for approximately half of the exchange rate over a 30 day horizon. Poland and Romania are again different, only that this time EURRON variance is mostly due to its own variance (94-99%) while in Poland MSCI Europe explains between 0-9% of EURPLN variance.

Stock Market and Exchange Rate Interactions in Emerging Europe

Conclusions (1)

- We confirmed that European and US stock market returns contain useful information in explaining the Emerging European (EE) stock market and exchange rate movements. Unsurprisingly, we found that European stock market is more relevant than US stock market in explaining the moves in both local EE currencies and stock indices at the daily frequency (economic and financial flow integration).
- However, at the monthly frequency, S&P500 accounted for a larger portion of EE variables movement, implying a longer-term correlation to global factors of the Emerging Europe area.
- A shock in global stock indices returns translates into a positive reaction of the EE stock markets and a negative response in the exchange rate, implying currency appreciation (with the exception of EURCZK, that gets only a very short term positive effect on the currency value, that becomes negative at lags at the daily frequency from the rise in S&P500 and MSCI Europe).
- Moreover, a positive shock in VIX, implying an expected increase in US S&P500 volatility leads to a negative reaction in general of both stock markets and currencies in EE. Therefore, on a local perspective, exchange rates and stock markets are inversely related, while the overall movement can be explained by global factors in a larger proportion than local factors (exchange rate when accounting for stock market index, and stock market index in an attempt to account for exchange rates).

Stock Market and Exchange Rate Interactions in Emerging Europe

Conclusions (2)

- While on the short term at the monthly frequency a positive shock in exchange rates creates a negative reaction in the stock market, the accumulated response turns positive after lag 3 in Czech Republic, after lag 2 in Romania and decisively positive after lag 4 in Poland while it remains negative in Hungary. The stock market, acting as a proxy for the economy, offers a positive response to a currency depreciation with a 2-4 month lag in the export-oriented economies of EE, while Hungary remains an exception.
- Variance study showed that in general a shock in the variance of S&P500 and MSCI Europe translates into a positive response of EE stock market and exchange rate variances that reach a high at lags 5 - 35 and then generally decay in two phases, a fast one ranging from 15 - 30 lags and a slow one after lags 40-80.
- S&P500 and MSCI Europe variance become dominant factors in explaining Czech Republic and Hungary stock market and exchange rate variances while Romania and Poland appear much more isolated from variance shock transmission.

Stock Market and Exchange Rate Interactions in Emerging Europe

What we add to literature and Further study

- What we added to the literature
 - A study of 4 EE countries in a SVAR specification including S&P500, VIX and MSCI Europe
 - A study of variance interactions in EE inside a global context
 - Different perspectives on the importance of US and Europe indices at Daily and Monthly frequency
 - Czech koruna seen as a short term safe haven
- Further study may include
 - Modeling variance with different models, such as FIGARCH
 - Defining and refining a spillover index
 - Using Multivariate GARCH methodology
 - Using intra-day frequency, especially when studying volatility interactions
 - Using different SVAR specifications

Stock Market and Exchange Rate Interactions in Emerging Europe

Practical Importance of Results

- Global factors reflected in returns of S&P500, MSCIE and VIX are important to Emerging Europe (EE) stock market and exchange rate dynamics
- MSCI Europe more important at the Daily frequency, S&P500 more important at the Monthly frequency
- Residual interaction between local exchange rate and stock market indices is negative, meaning positive impact of currency appreciation on the stock market, and positive stock market appreciation impact on the exchange rate
- Czech Republic acts as a currency *short term safe haven*
- Volatility depends on global indices volatility
- Local volatility spillover likely from the stock market to the exchange rate
- EE stock market and exchange rate should be seen in a global and European context
 - International investors need to hedge their currency exposure, with the exception of the Czech Republic, over the short term
 - Local investors need to pay attention to global information contained in stock and volatility indices (because it impacts Emerging Europe stock market indices and exchange rates)
 - Policymakers in EE should keep an eye on European and US market developments (supposedly and hopefully they already do)

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Stock Market and Exchange Rate Interactions in Emerging Europe

Thank you!

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