

The Impact of Oil Price Volatility on the Macroeconomy

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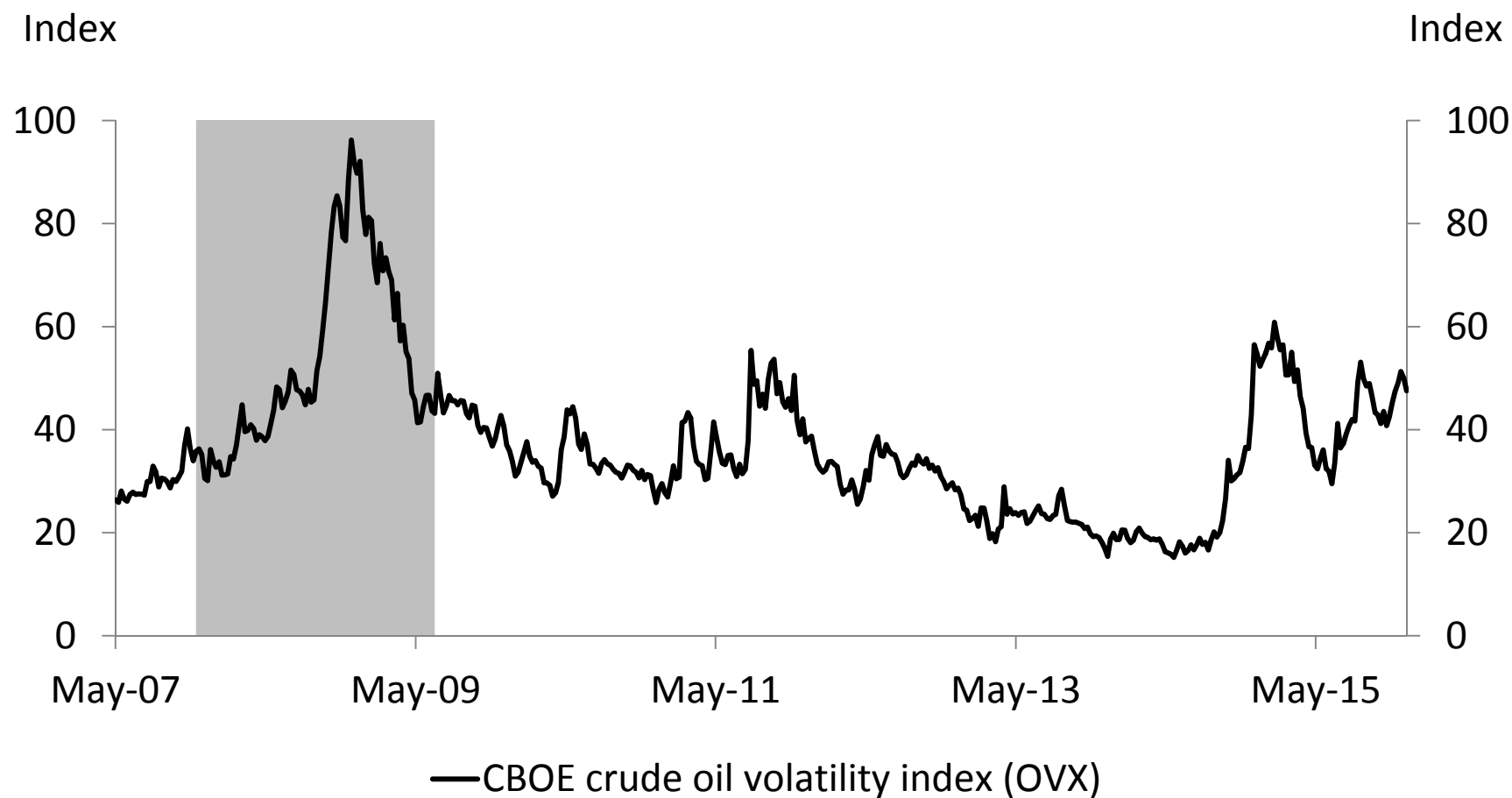
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Oil price volatility overview

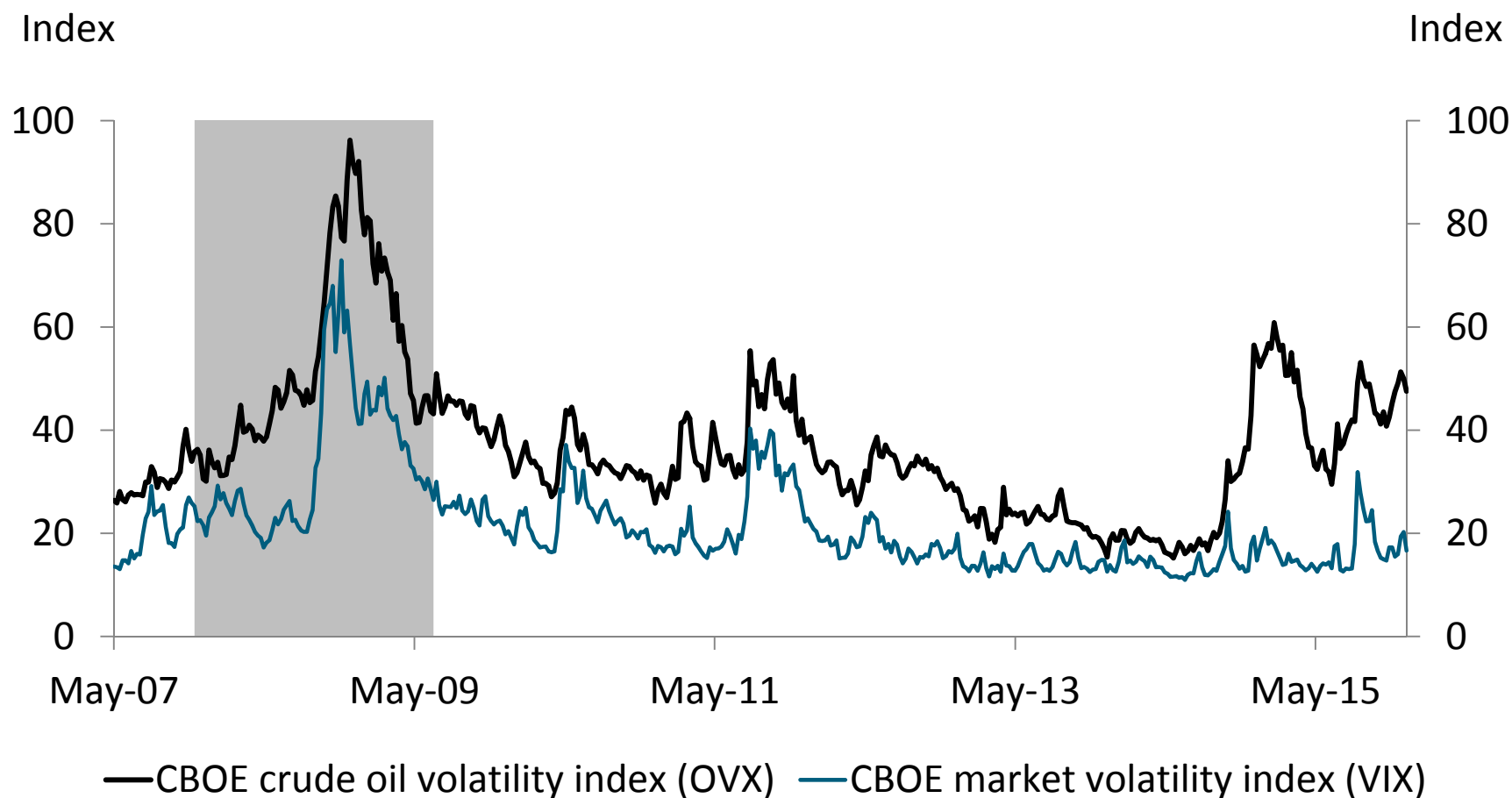
- Oil price volatility (OVX) has remained elevated since mid-2014, even when compared to measures of equity market volatility
- Macro and financial market effects of higher OVX:
 - A direct effect on employment and investment in the energy sector
 - Conveys a “risk off” sentiment that corresponds to a strengthening in the foreign exchange value of the US dollar
 - Drives up spreads on high-yield debt
 - Lowers market-based measures of inflation expectations

Oil price volatility has remained elevated since mid-2014



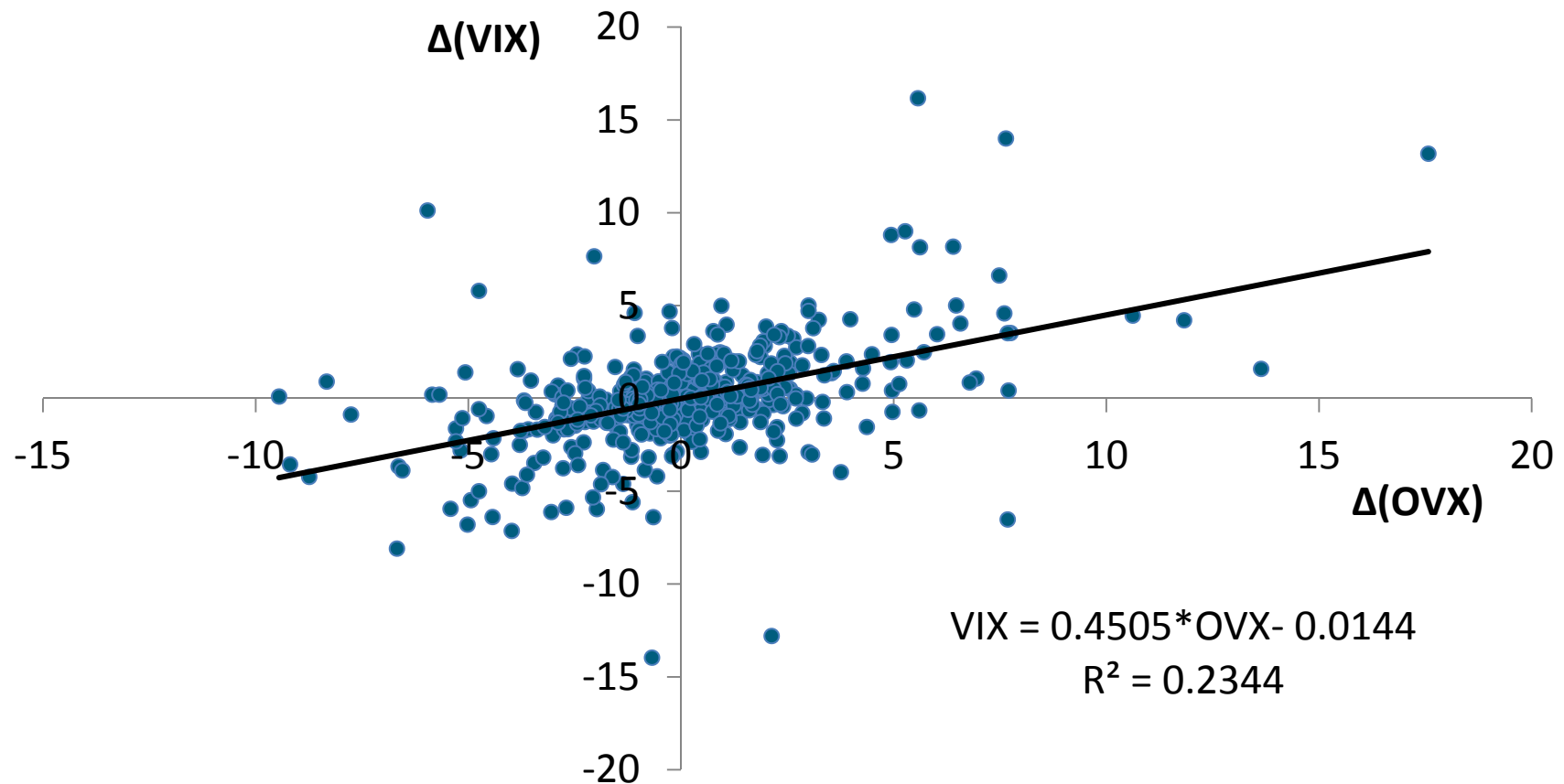
Sources: CBOE, NBER, Haver Analytics

Oil price volatility often moves in tandem with equity market volatility



Sources: CBOE, NBER, Haver Analytics

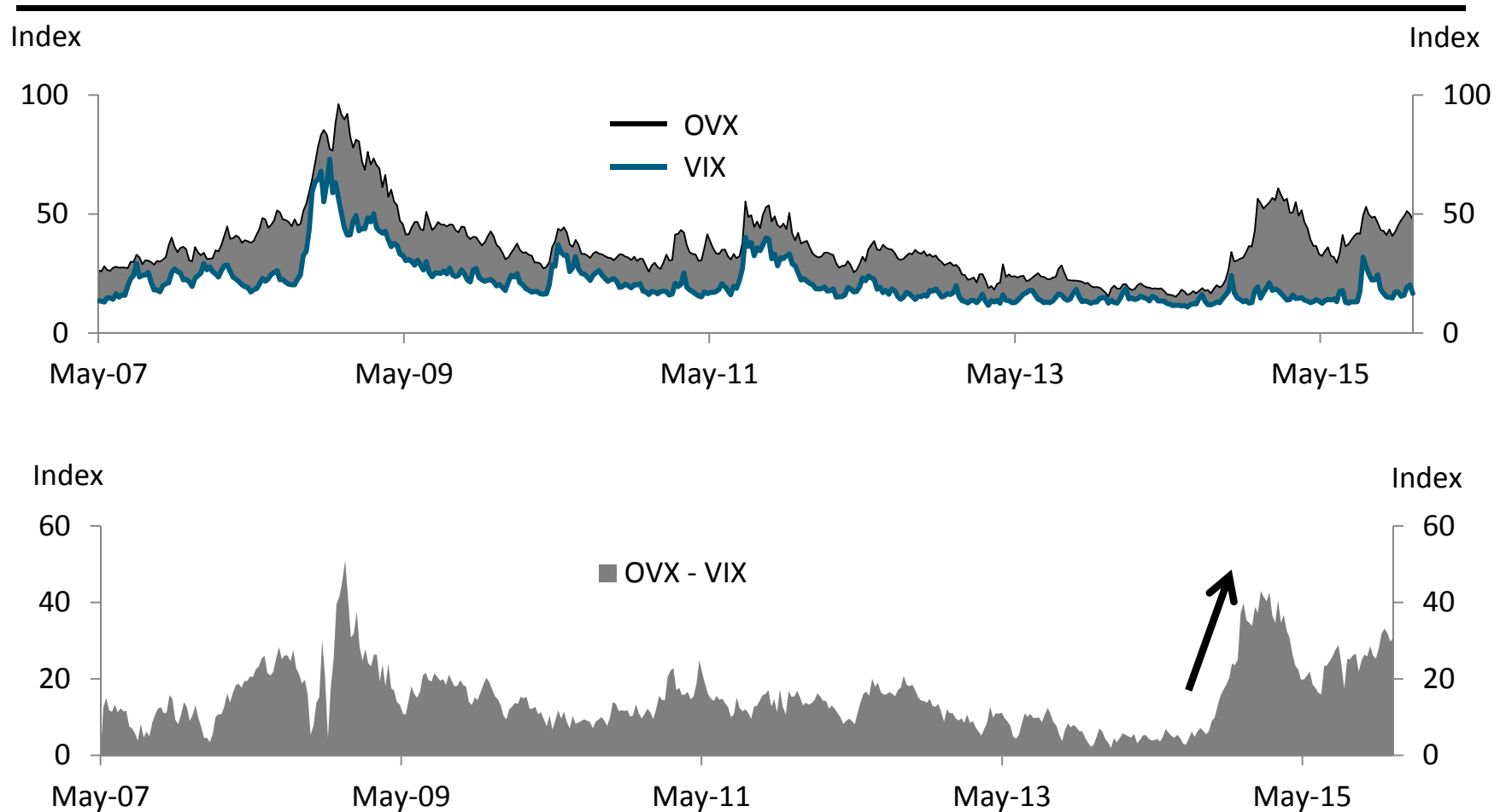
Changes in oil price volatility are about twice that of equity market volatility



Weekly changes within 2007-2015.

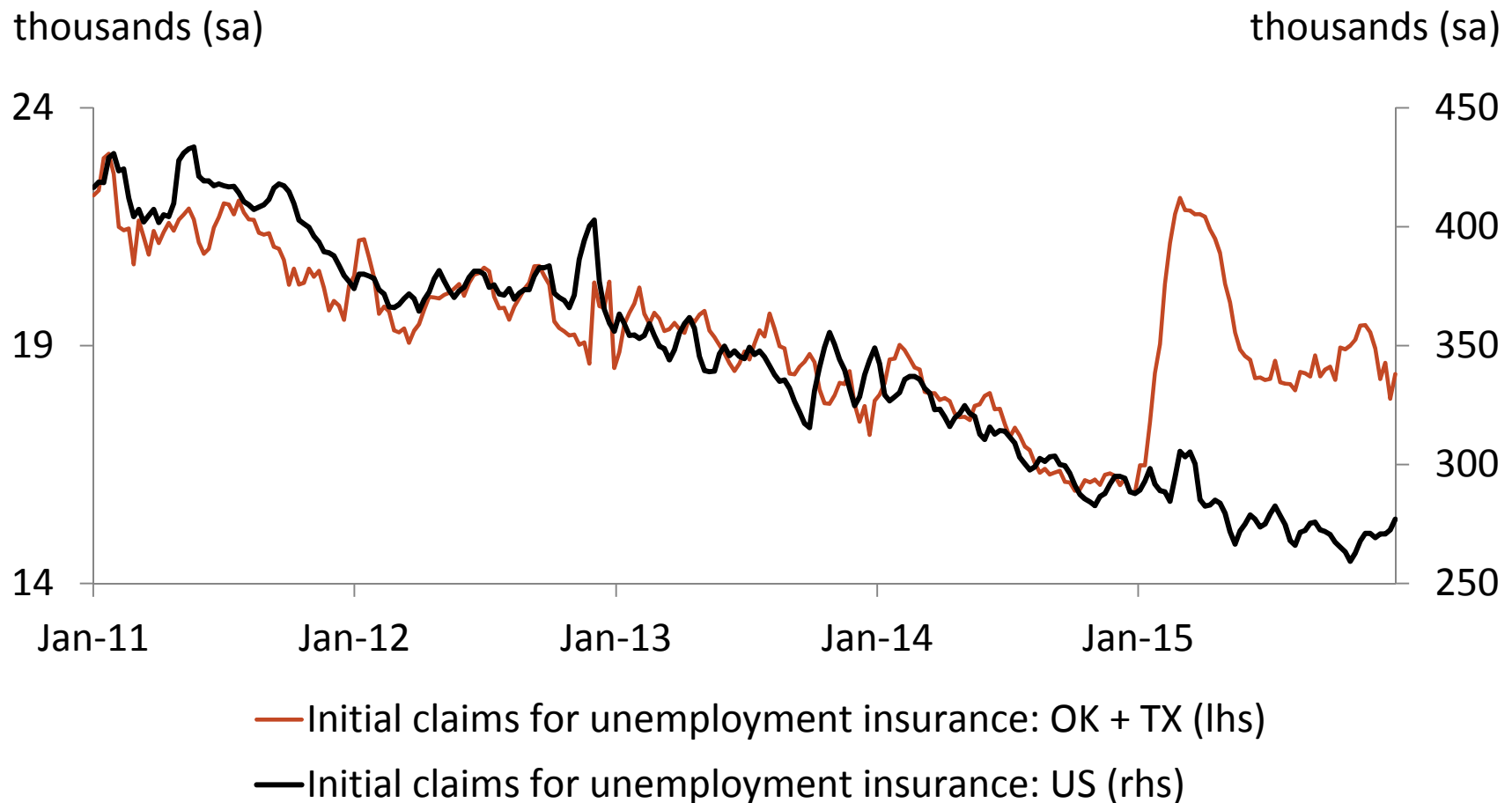
Sources: CBOE

Oil price volatility has been high even relative to overall market volatility



Source: CBOE, Haver Analytics

Oil price movements have clearly affected energy intensive states



Sources: Department of Labor, Haver Analytics

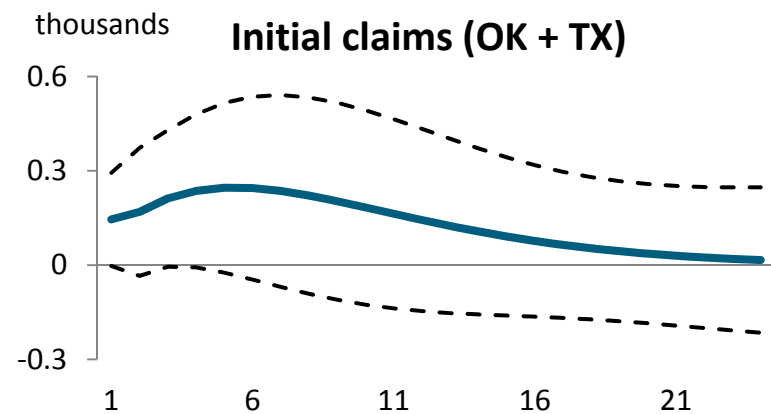
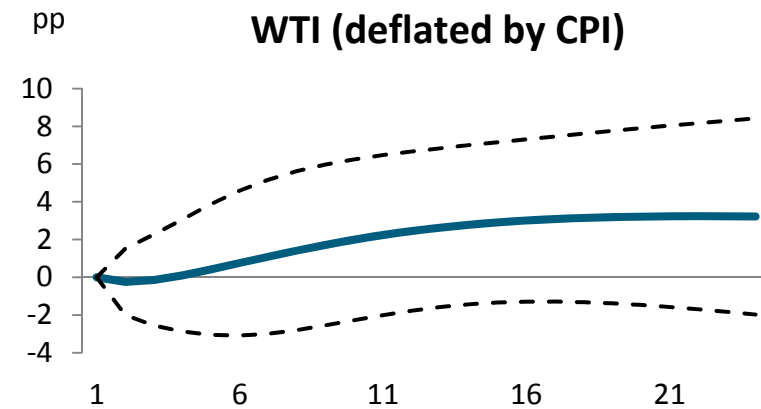
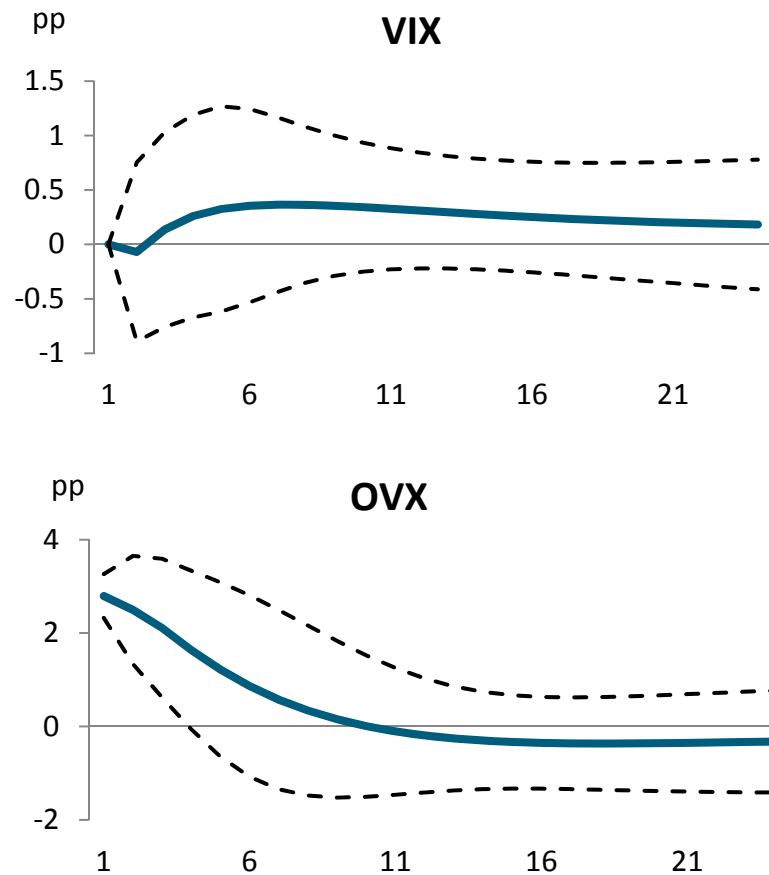
Evaluating the effect of higher OVX

- VAR framework (n lags): $A_0 z_t = \alpha + \sum_{i=1}^n A_i z_{t-i} + \varepsilon_t$
- With the following shock structure

$$e_t = \begin{pmatrix} e_{1,t} \\ e_{2,t} \\ e_{3,t} \\ e_{4,t} \end{pmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{pmatrix} \varepsilon_t^{VIX} \\ \varepsilon_t^{Oil} \\ \varepsilon_t^{OVX} \\ \varepsilon_t^Z \end{pmatrix}$$

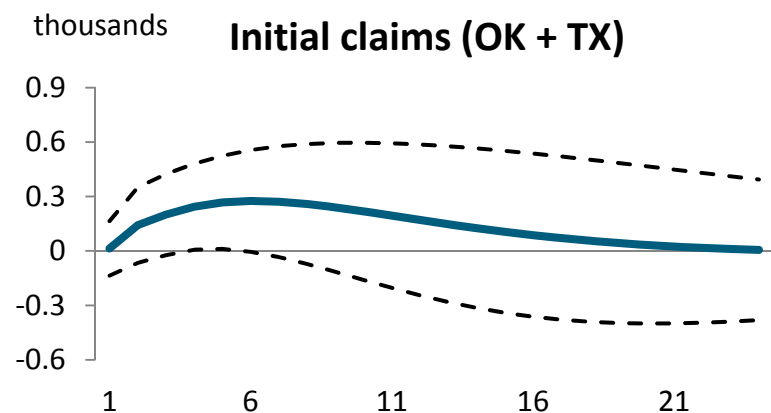
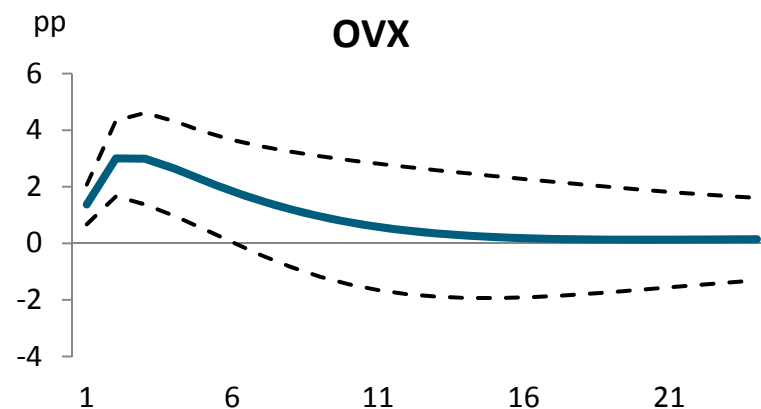
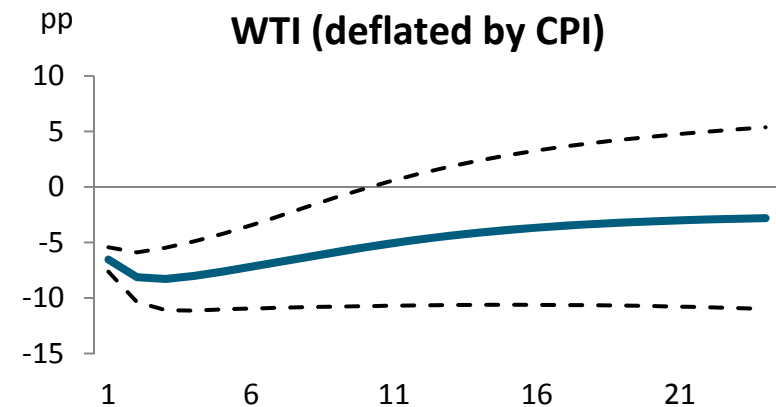
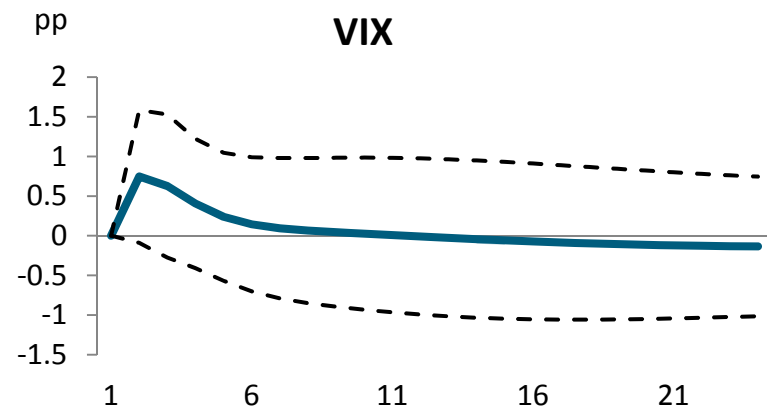
where $e_t = A_0^{-1} \varepsilon_t$, *Oil* is the log real price of oil (deflated by headline CPI) and *Z* is a variable of interest (e.g. a currency valuation, employment, etc.)

OVX shock: Increases layoffs within the energy sector



+/- 2-standard deviation bands. Sample 2010-2015. $n=2$.

WTI shock: Drives OVX higher and increases initial claims for unemployment insurance in energy intensive states

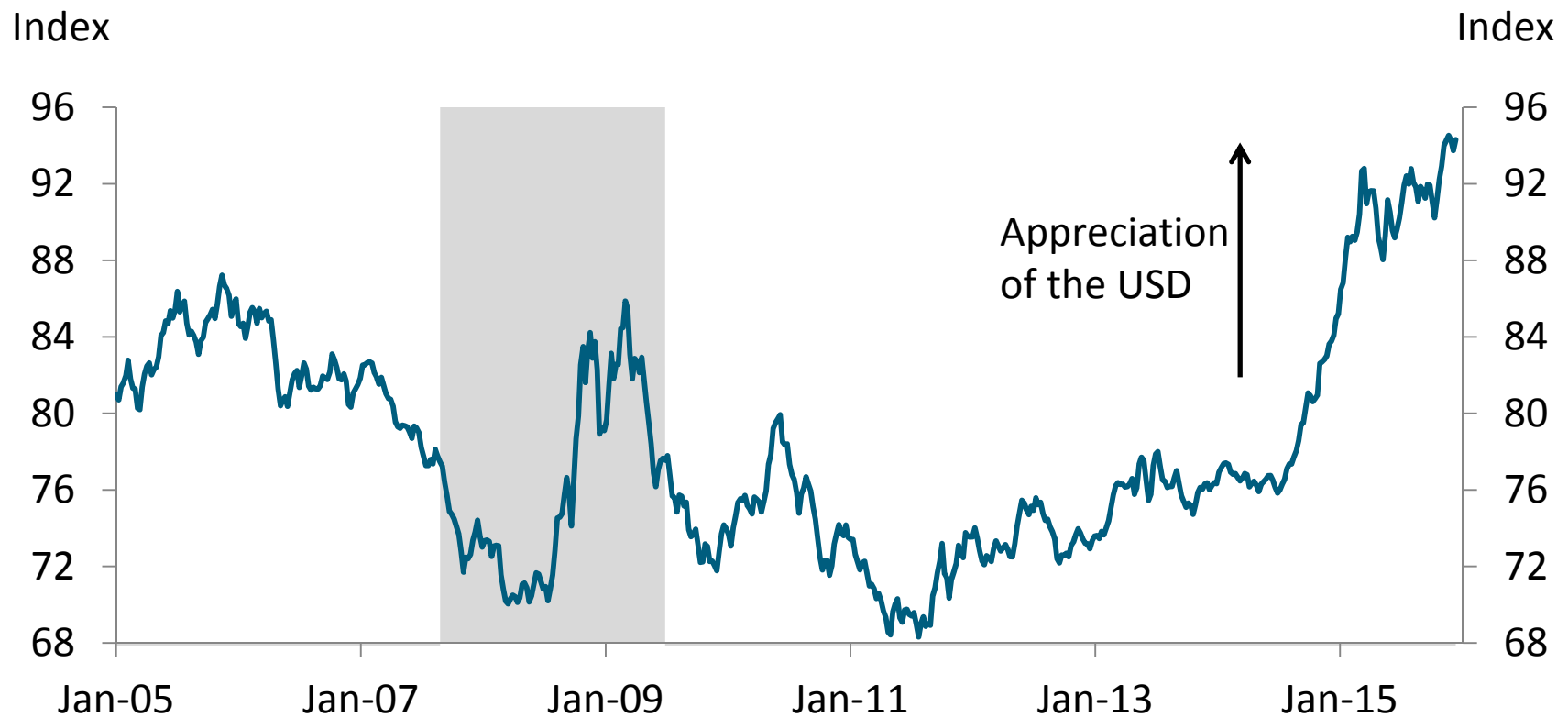


+/- 2-standard deviation bands. Sample 2010-2015. $n=2$.

OVX and WTI price impacts on employment

- A 3pp unexpected increase in OVX or 5% m/m decline in WTI prices result in a similar amount of layoffs in energy intensive states
- The decline in oil prices has some “knock on” effects, since OVX rises when WTI prices fall
 - In contrast, WTI prices do not react to shocks to OVX
- Variance decompositions show that OVX and WTI prices explain similar amounts of variation in initial claims in energy intensive states

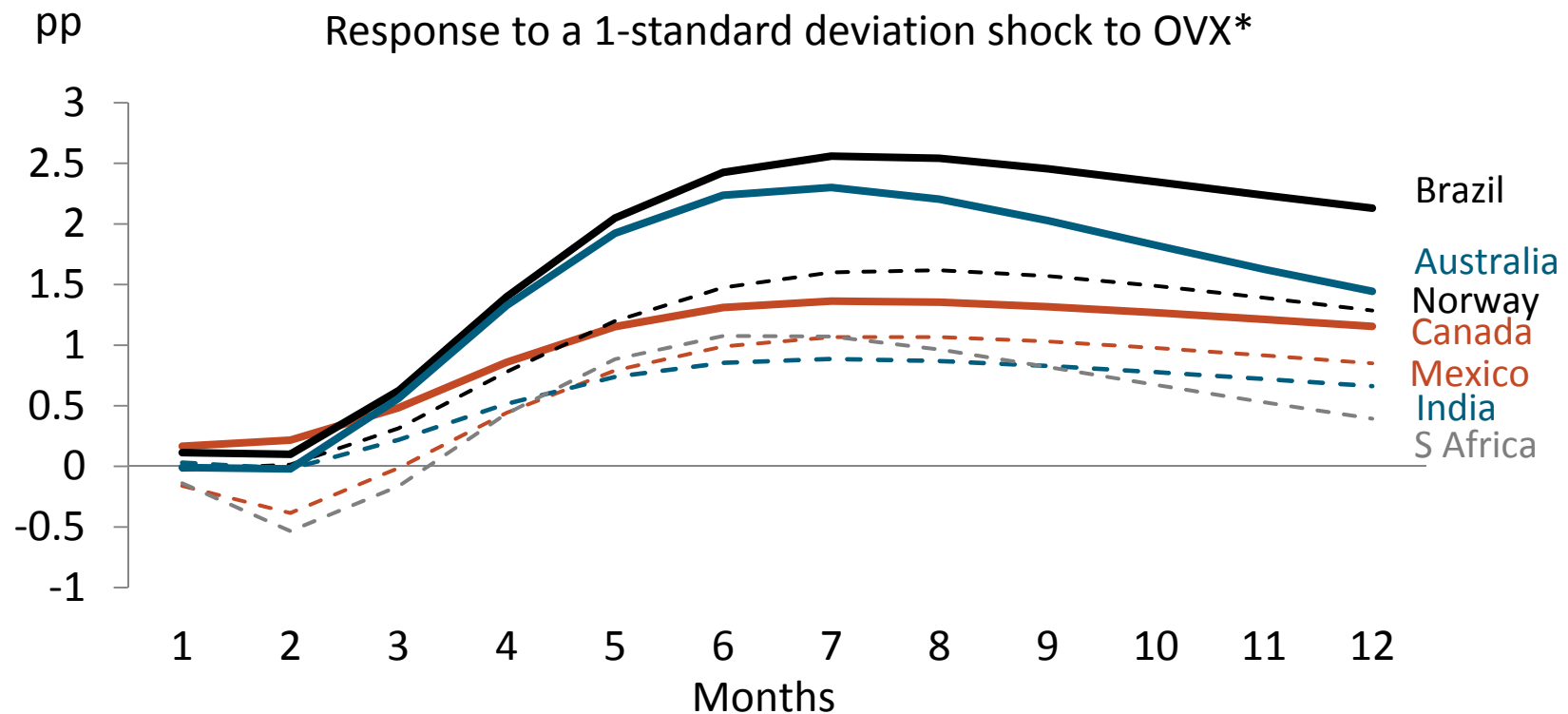
The foreign exchange value of the US dollar has risen sharply since late 2014



— Nominal trade-weighted exchange value of US\$ vs major currencies

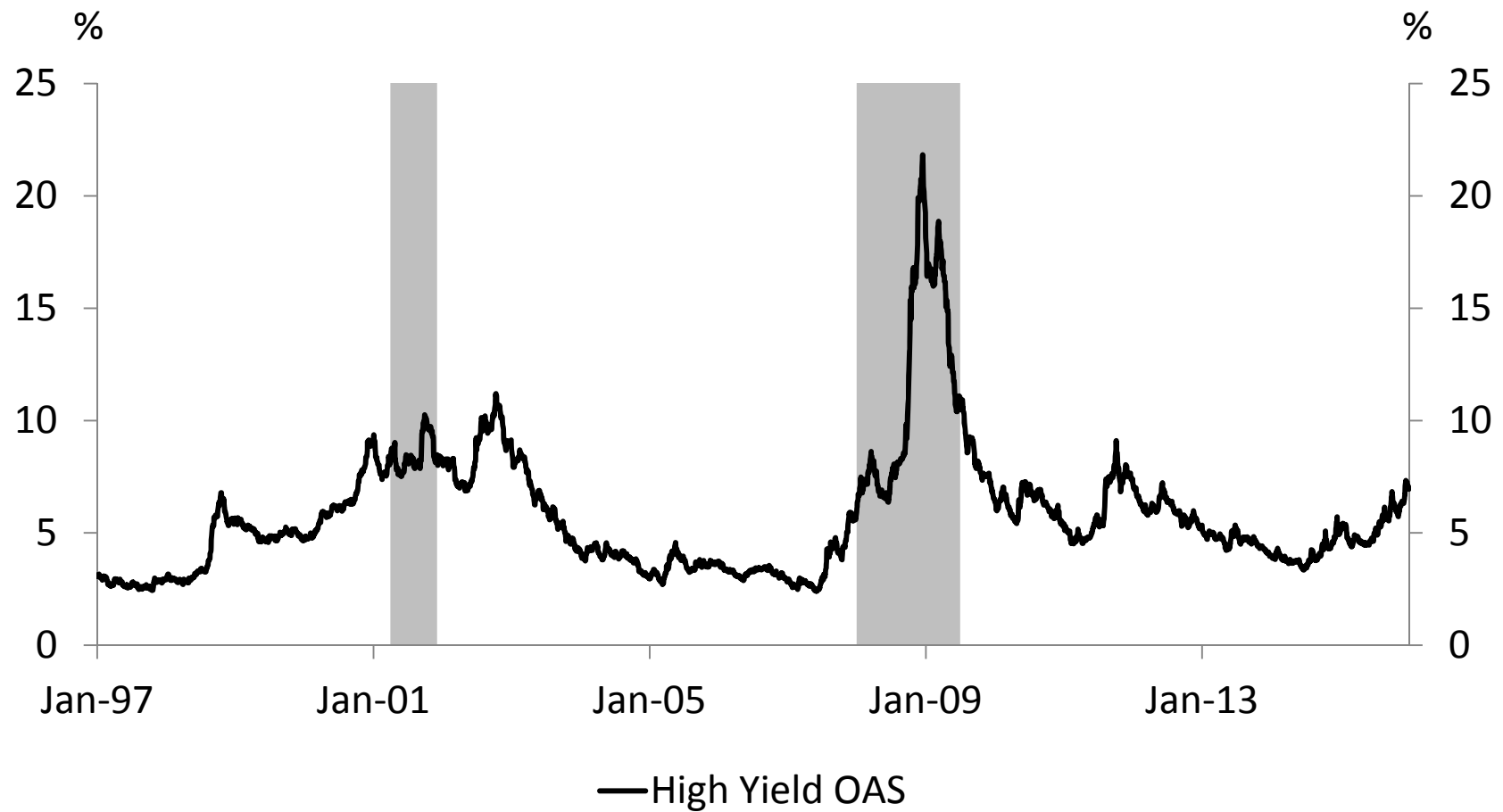
Sources: Federal Reserve Board, Haver Analytics

A shock to OVX leads some emerging market currencies to depreciate relative to the US dollar



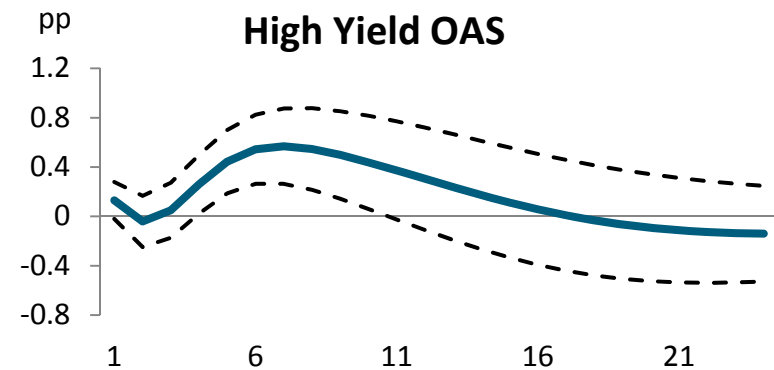
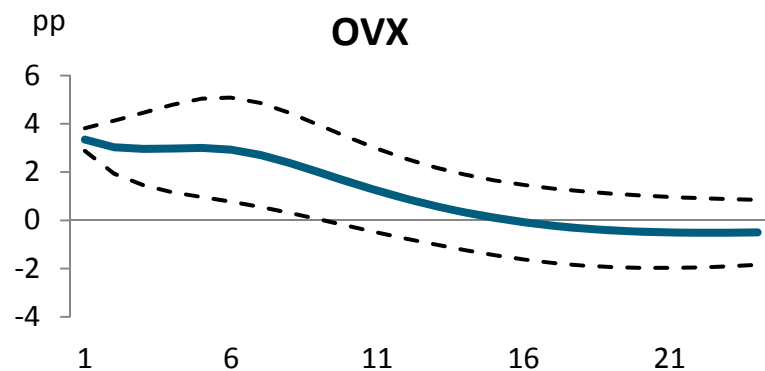
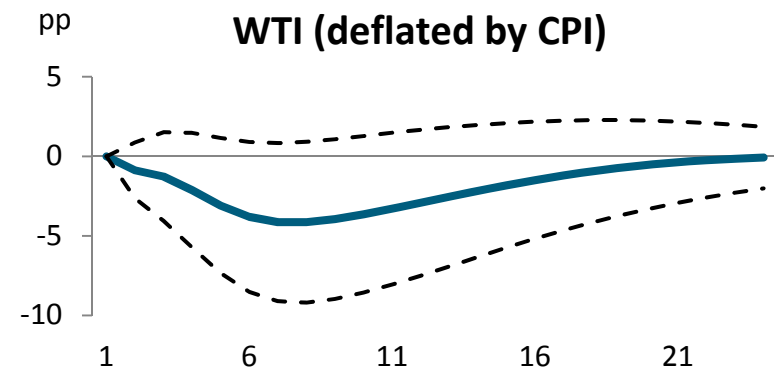
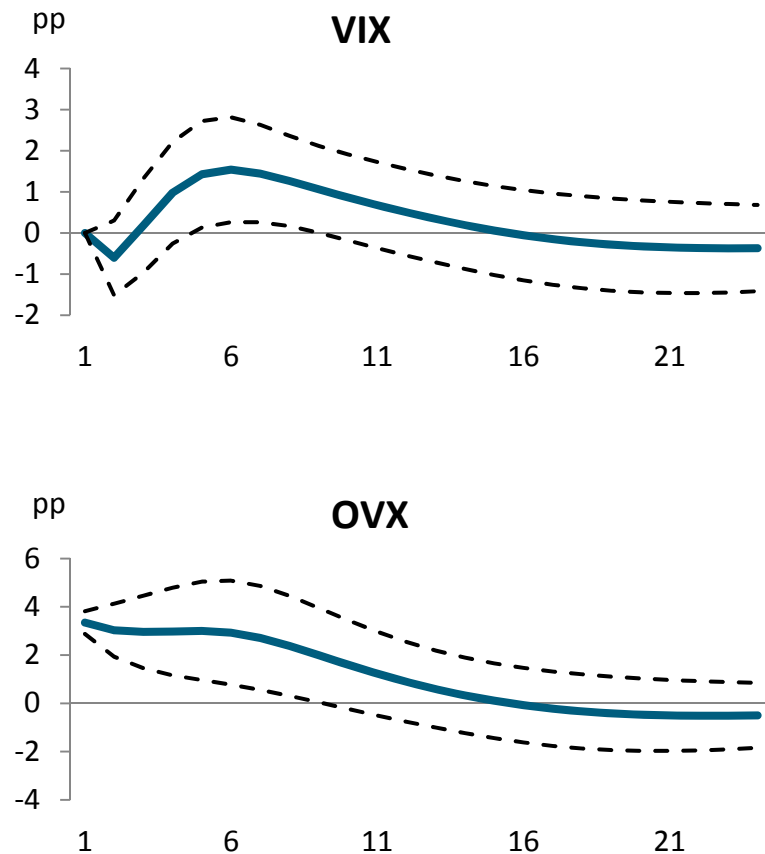
*Solid lines denote a significant response at a 95% confidence level at some point 12 months following the shock.
Sample 2007-2015. n=2.

Spreads on higher-yield debt have widened



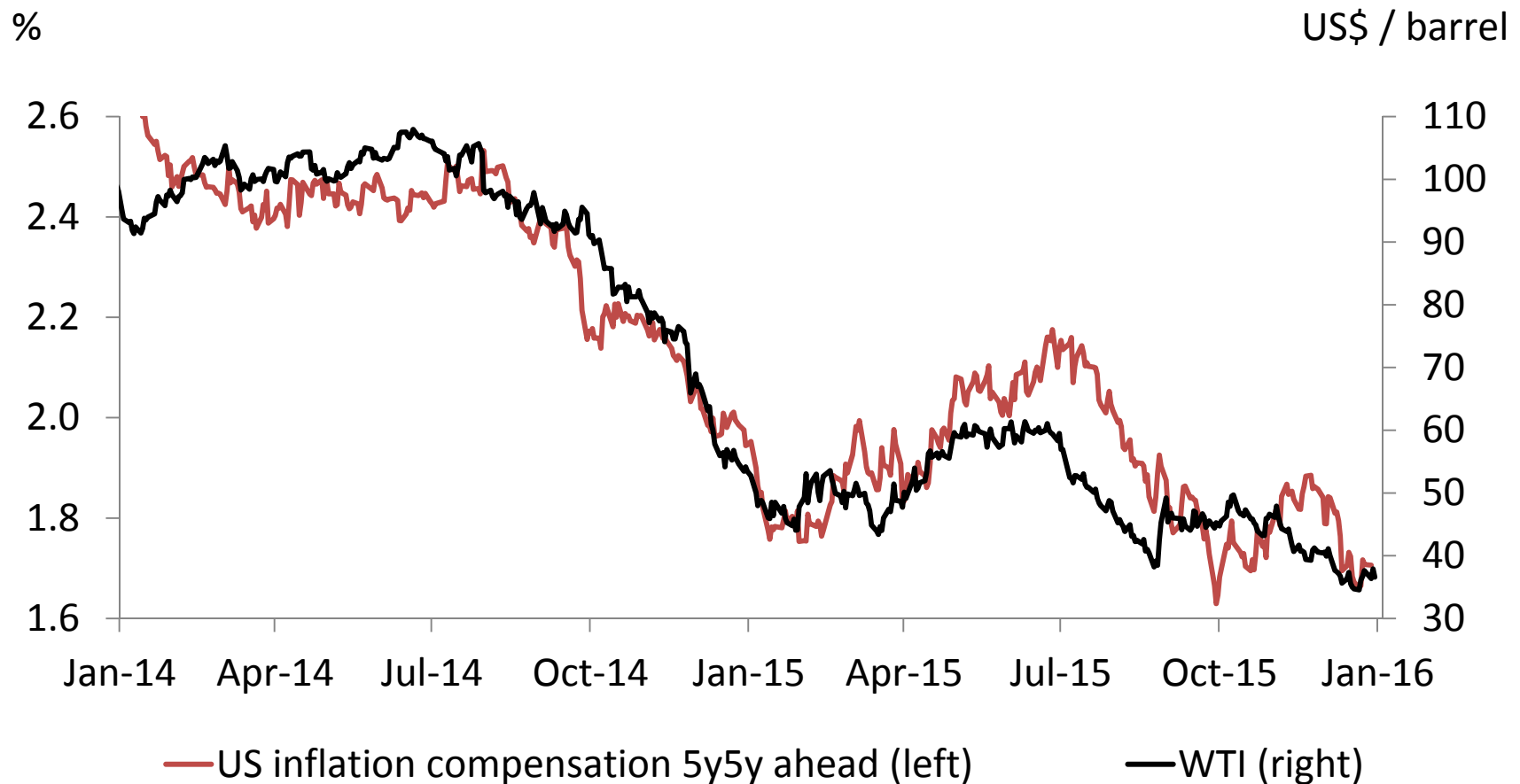
Sources: BOAML, Haver Analytics

OVX shock: Increases high-yield spreads



+/- 2-standard deviation bands. Sample 2007-2015. n=2.

Market-based measures of longer-term inflation compensation have co-moved closely with oil prices



Sources: Federal Reserve Board, EIA, Haver Analytics

Longer-term inflation compensation was sensitive to oil prices prior to the global financial crisis...

$$\Delta (5y \text{ BEI}) = \alpha + \beta \Delta \log (\text{WTI}) + \varepsilon_t$$

	Constant	$\Delta \log (\text{WTI})$	R^2
$\Delta (5y \text{ BEI})$	-0.001 (0.001)	0.41* (0.06)	.096
$\Delta (5y5y \text{ BEI})$	0.0005 (0.001)	0.14* (0.06)	.014

Sample: 1/1/2005-7/1/2007

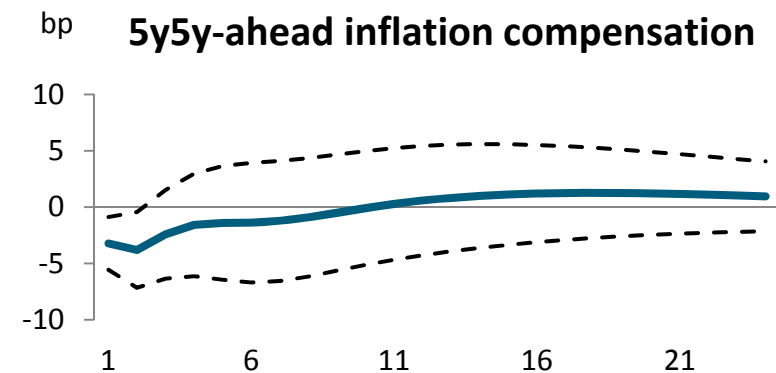
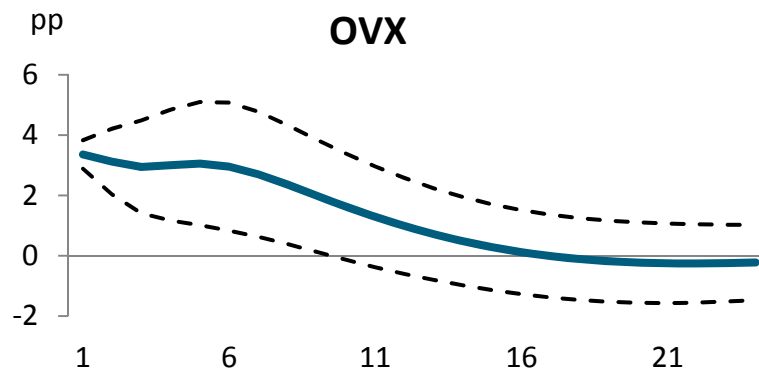
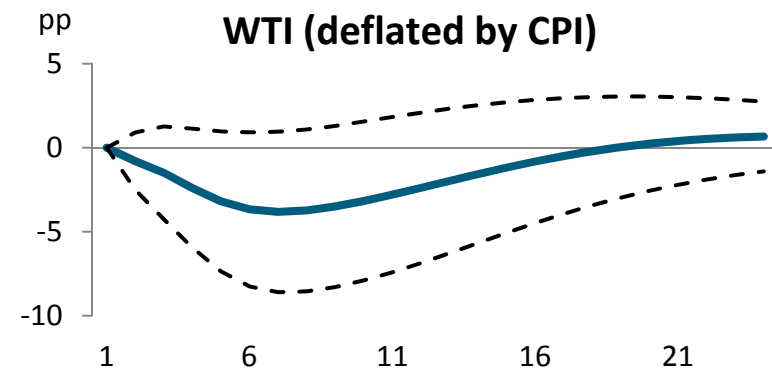
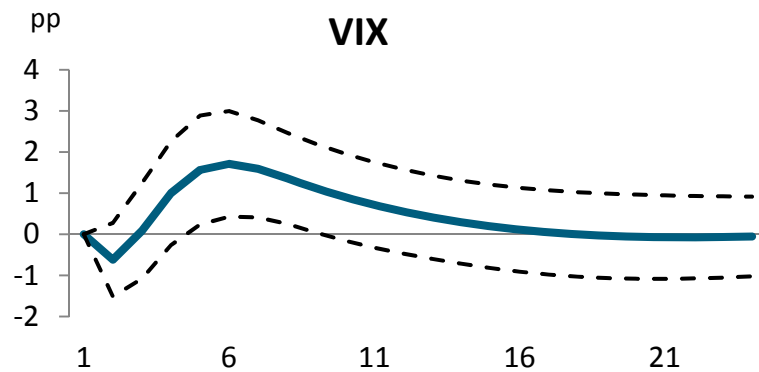
...but, has become more sensitive to oil prices

$$\Delta (5y \text{ BEI}) = \alpha + \beta \Delta \log (\text{WTI}) + \varepsilon_t$$

	Constant	$\Delta \log (\text{WTI})$	R^2
$\Delta (5y \text{ BEI})$	0.0008 (0.001)	0.87* (0.06)	.17
$\Delta (5y5y \text{ BEI})$	−0.0003 (0.001)	0.59* (0.07)	.057

Sample: 7/1/2009-10/2/2015

OVX shock: Temporarily lowers longer-term inflation compensation



+/- 2-standard deviation bands. Sample 2007-2015. n=2.

Summary

- First-order effects arise from oil prices, but oil price volatility appears to play an important independent role in a number of dimensions
- Deeper question is what drives OVX
 - Plante (2015) constructs an article count variable related to OPEC events that explains a meaningful amount of OVX
- Impact of OVX on longer-term inflation compensation relevant for monetary policy