

The relationship between energy commodities and exchange rates

Seminar in Applied Financial Economics: Applied Econometrics of FX Markets - Professor Reitz

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Intro: Energy Commodities and Exchange Rates

This has led some to suggest that an unidentified real factor may be causing persistent shifts in real equilibrium exchange rates.

— R.A. Amano, S. van Norden¹

This may in fact be the case or it is also possible that the relationship between exchange rates and oil shocks is non-linear and not being detected by a linear regression framework.

— S. A. Basher, A. A. Haug, P. Sadorsky²

The long-run real exchange rate of these ‘commodity currencies’ is not constant (as would be implied by purchasing power parity-based models) but is time varying, being dependent on movements in the real price of commodity exports.

— P. Cashin, L. F. Cespedes, R. Sahay³

¹ Oil prices and the rise and fall of the US real exchange rate, R.A. Amano, S. van Norden, Journal of International Money and Finance 17 (1998) 299-316, p.301

² The impact of oil shocks on exchange rates: A Markov-switching approach, S. A. Basher, A. A. Haug, P. Sadorsky, Energy Economics 54 (2016) 11–23, p.17

³ Commodity currencies and the real exchange rate, P. Cashin, L. F. Cespedes, R. Sahay, Journal of Development Economics 75 (2004) 239–268, p.239

Intro: The PPP puzzle and Commodity Currencies

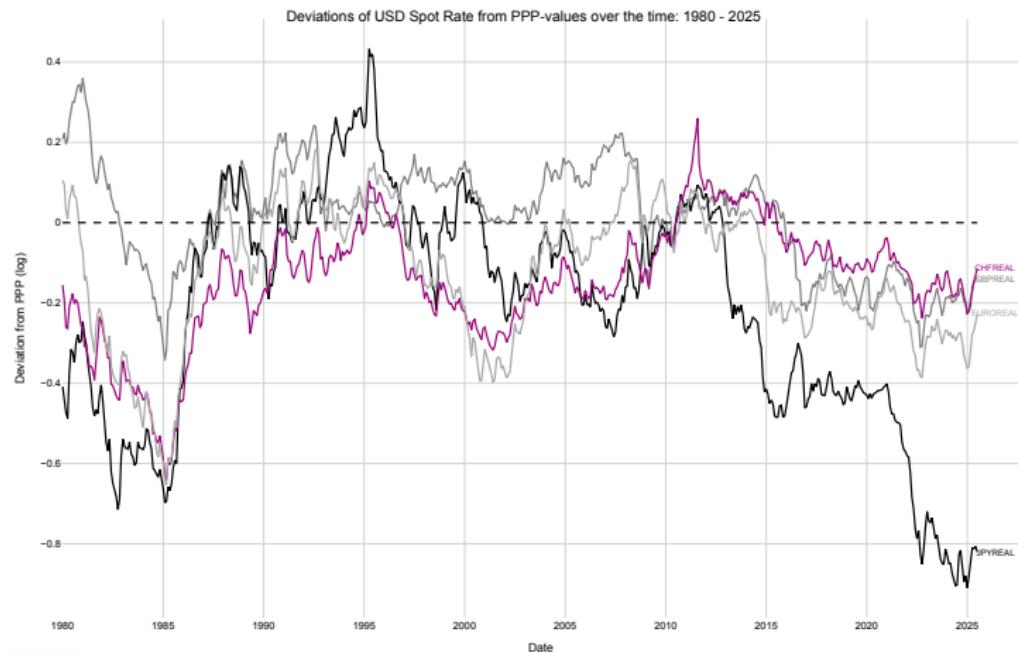


Figure: Deviations of USD Spotrate from PPP-values (in log terms).⁴

⁴Own Illustration based on XYZ (2000), page 7 and data accessed 10.09.25.

This puzzle concerns the finding of many researchers that the speed of mean reversion of real exchange rates is too slow to be ↗ ↘

Modern Energy Commodity Markets The current state

Oil: Global Production and Consumption over time

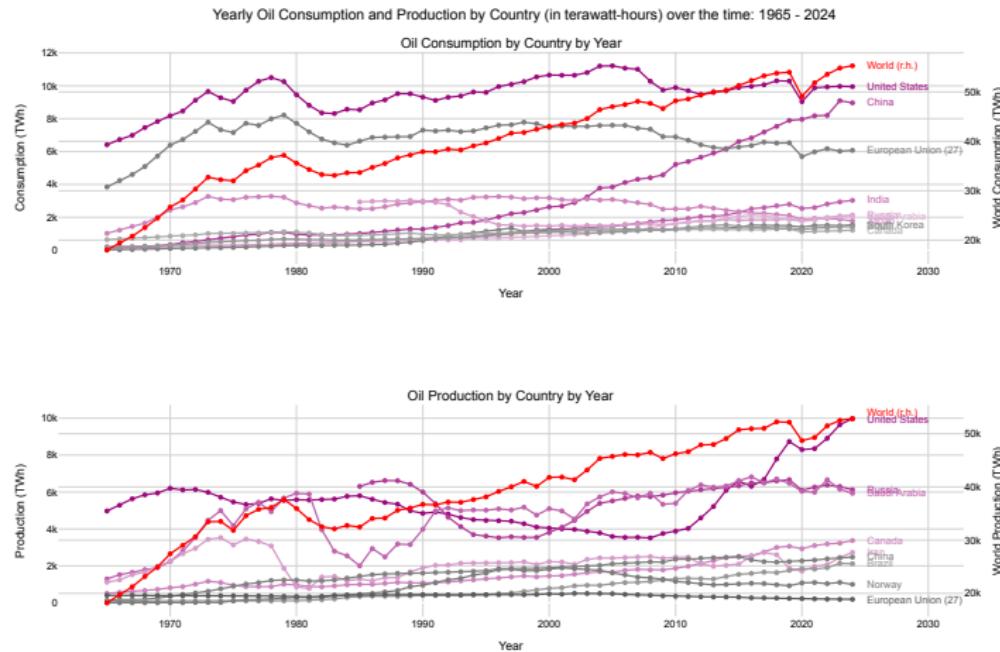


Figure: Global Oil Production and Consumption over time - in terawatt-hours (TWh).⁵

⁵ Own Illustration based on XYZ (2000), page 7 and data accessed 10.09.25.

Gas: Global Production and Consumption over time

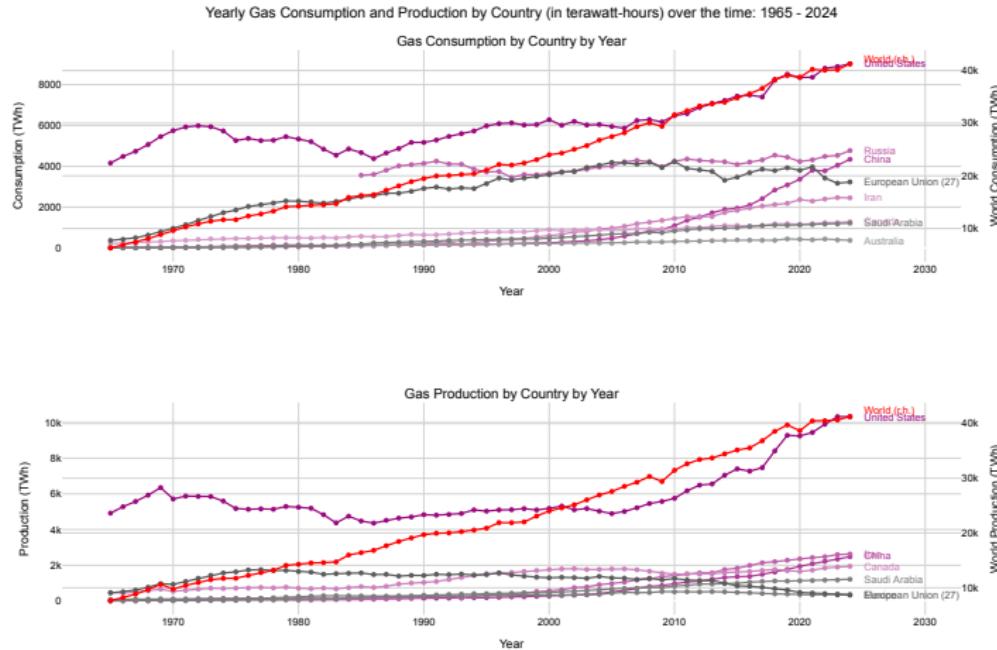


Figure: Global Natural Gas Production and Consumption over time - in terawatt-hours (TWh).⁶

⁶Own Illustration based on XYZ (2000), page 7 and data accessed 10.09.25.

Financial Markets: Oil and Gas OI over time

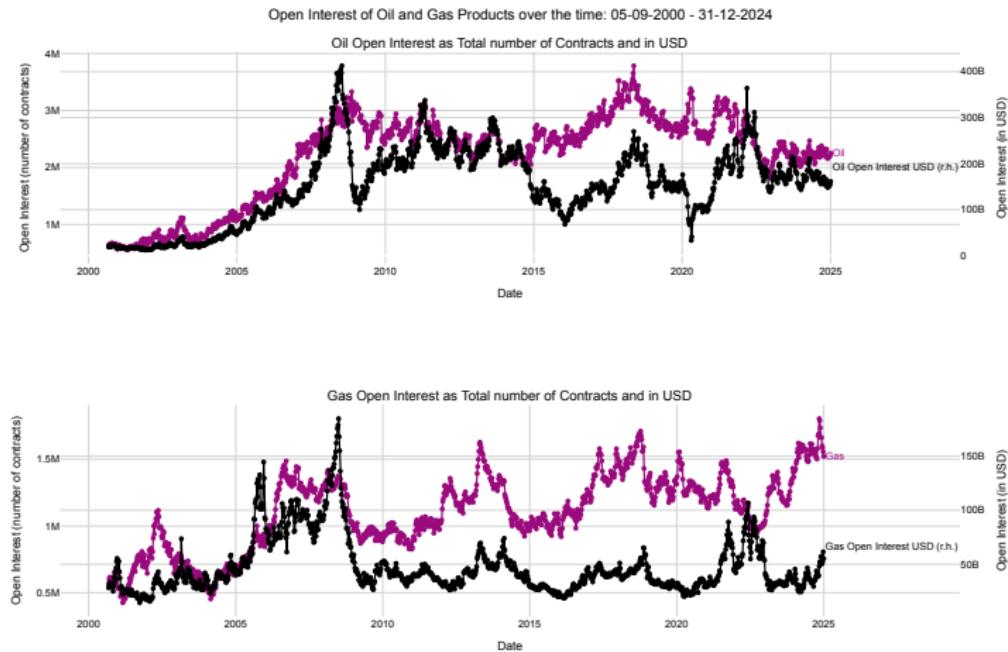


Figure: Oil and Gas Open Interest over time.⁷

⁷ Own Illustration based on XYZ (2000), page 7 and data accessed 10.09.25.

Research Hypothesis

Energy Price Contributions to Inflation

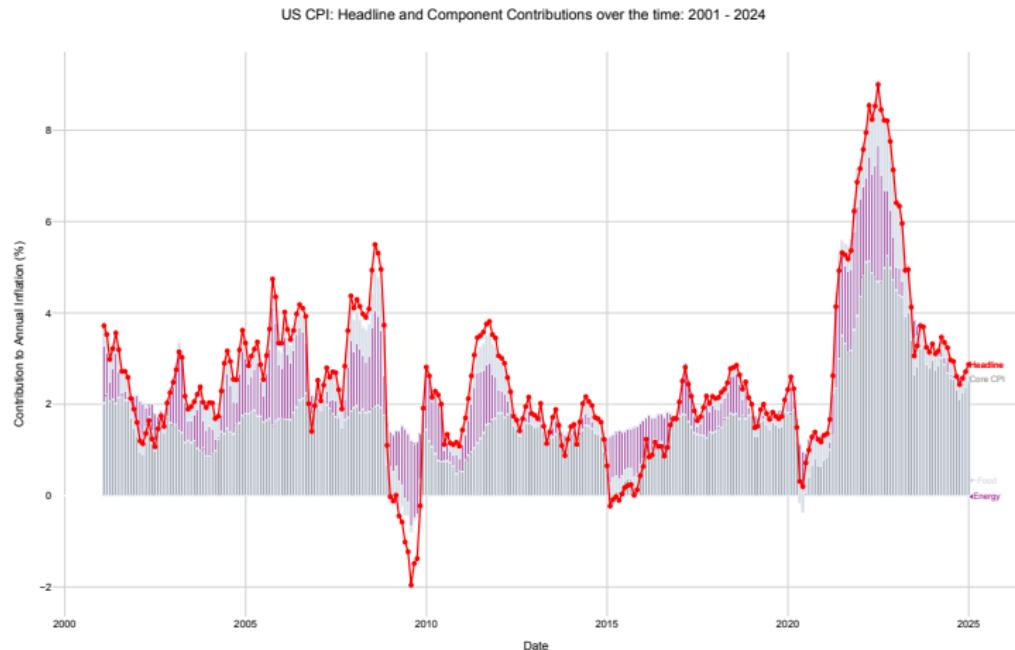


Figure: US CPI and its main components over the time: 2000 - 2025.⁸

⁸Own Illustration based on U.S. Bureau of Labor Statistics (2025), page 7 and data accessed 10.09.25.

Energy Price Contributions to Inflation

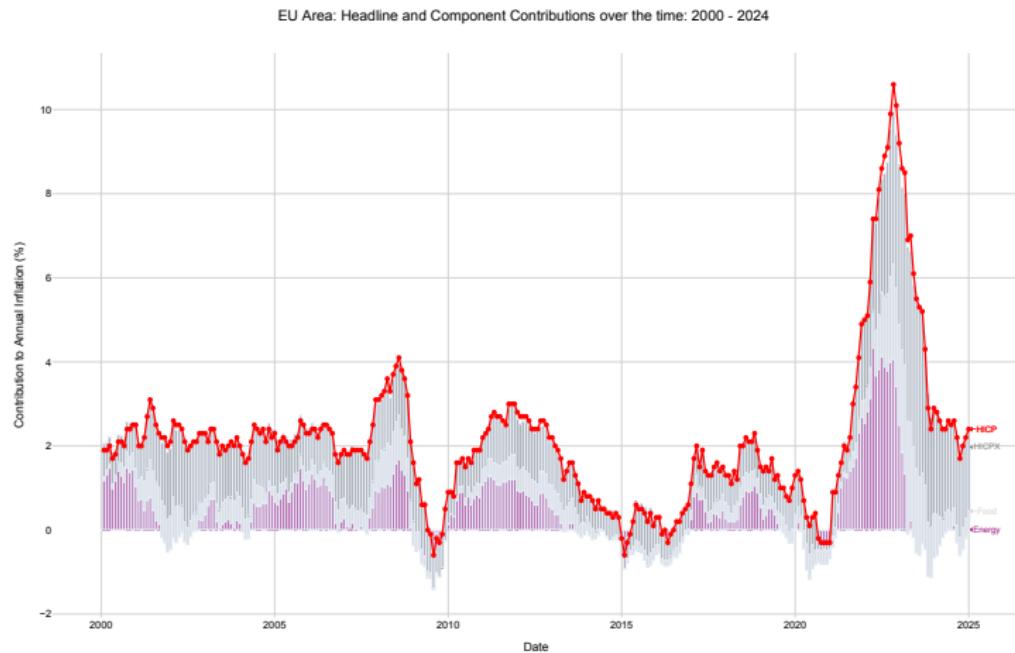


Figure: EU Area CPI and its main components over the time: 2000 - 2025.⁹

⁹Own Illustration based on U.S. Bureau of Labor Statistics (2025), page 7 and data accessed 10.09.25.

Energy Commodity Price Shocks: Economic Rationale

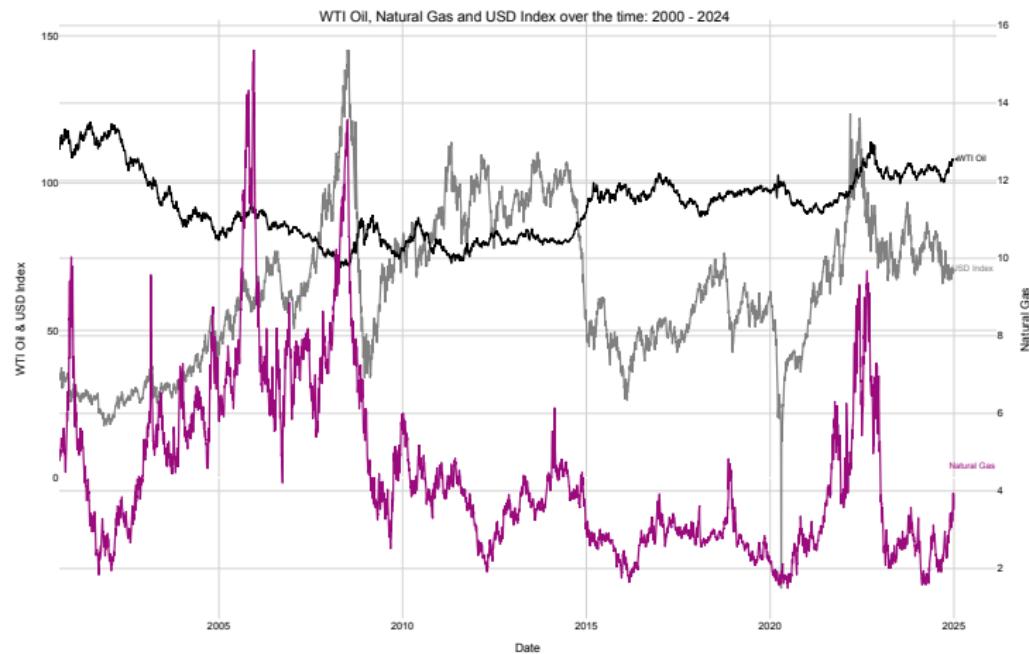


Figure: USD Index, WTI and Natural Gas over the time: 2000 - 2025.¹⁰

¹⁰ Own Illustration based on U.S. Bureau of Labor Statistics (2025), page 7 and data accessed 10.09.25.

Formulated Research Hypothesis

Main Research Hypothesis

"Exchange Rates and energy commodity prices are interconnected over several time frequencies and horizons, predominantly during times of (financial market) distress. Energy commodity price shocks primarily enter through the inflation dynamics channel, influencing both short-term price levels and long-term inflation expectations, thereby also affecting monetary policy decisions."

Additional Research Hypothesis I

"The pass-through effect of energy commodity price shocks to overall inflation is asymmetric, non-linear and time-varying, with price increases having a more pronounced effect than price decreases."

Additional Research Hypothesis II

"The pass-through effect intensified with growing financialization of energy commodity markets, leading to stronger correlations between

Chapter 3)

Literature Review

The connection between Energy Commodity Prices and Inflation

- Energy prices have been a significant driver of inflation in recent years, particularly due to geopolitical tensions and supply chain disruptions.
- The volatility in energy markets has led to increased costs for transportation, manufacturing, and household energy consumption.
- Central banks face challenges in managing inflation expectations while considering the transitory nature of energy price shocks.

Systematic Literature Overview: Main Approaches

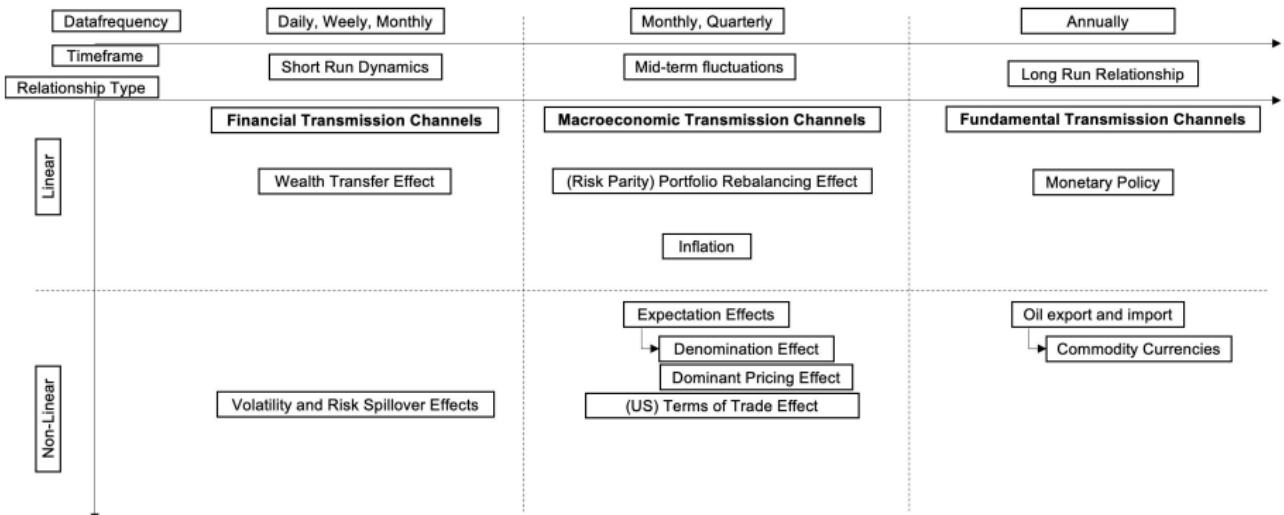


Figure: Systematic Overview about main approaches.¹¹

¹¹ Own Illustration based on XYZ (2000), page 7 and data accessed 10.09.25.

Chapter 4)

Methodology Overview

Definitions

A simple model of exchange rates and commodity prices

Systematic Methodology Overview: Linear vs. Non-linear approaches

Theoretical Framework

Classical (Linear) and Machine-Learning (Non-linear) Appraoches: A comparison

(Financial) Market Distress: Important periods and their characteristics

Chapter 6)

Used Data

Chapter 7)

Model Results

Paragraphs of Text

Sed iaculis dapibus gravida. Morbi sed tortor erat, nec interdum arcu. Sed id lorem lectus. Quisque viverra augue id sem ornare non aliquam nibh tristique. Aenean in ligula nisl. Nulla sed tellus ipsum. Donec vestibulum ligula non lorem vulputate fermentum accumsan neque mollis.

Sed diam enim, sagittis nec condimentum sit amet, ullamcorper sit amet libero. Aliquam vel dui orci, a porta odio.

— Someone, somewhere...

Nullam id suscipit ipsum. Aenean lobortis commodo sem, ut commodo leo gravida vitae. Pellentesque vehicula ante iaculis arcu pretium rutrum eget sit amet purus. Integer ornare nulla quis neque ultrices lobortis.

Lists

Bullet Points and Numbered Lists

- Lorem ipsum dolor sit amet, consectetur adipiscing elit
 - Aliquam blandit faucibus nisi, sit amet dapibus enim tempus
 - Lorem ipsum dolor sit amet, consectetur adipiscing elit
 - Nam cursus est eget velit posuere pellentesque
 - Nulla commodo, erat quis gravida posuere, elit lacus lobortis est, quis porttitor odio mauris at libero
-
- 1 Nam cursus est eget velit posuere pellentesque
 - 2 Vestibulum faucibus velit a augue condimentum quis convallis nulla gravida

Blocks of Highlighted Text

Block Title

 Lorem ipsum dolor sit amet, consectetur adipiscing elit. Integer lectus
 nisl, ultricies in feugiat rutrum, porttitor sit amet augue.

Example Block Title

 Aliquam ut tortor mauris. Sed volutpat ante purus, quis accumsan.

Alert Block Title

 Pellentesque sed tellus purus. Class aptent taciti sociosqu ad litora
 torquent per conubia nostra, per inceptos himenaeos.

 Suspendisse tincidunt sagittis gravida. Curabitur condimentum, enim
 sed venenatis rutrum, ipsum neque consectetur orci.

Multiple Columns

Subtitle

Heading

- ① Statement
- ② Explanation
- ③ Example

Lorem ipsum dolor sit amet,
consectetur adipiscing elit. Integer
lectus nisl, ultricies in feugiat
rutrum, porttitor sit amet augue.
Aliquam ut tortor mauris. Sed
volutpat ante purus, quis
accumsan dolor.

Table

Subtitle

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table caption

Definitions & Examples

Definition

A **prime number** is a number that has exactly two divisors.

Example

- 2 is prime (two divisors: 1 and 2).
- 3 is prime (two divisors: 1 and 3).
- 4 is not prime (**three** divisors: 1, 2, and 4).

You can also use the theorem, lemma, proof and corollary environments.

Theorem, Corollary & Proof

Theorem (Mass–energy equivalence)

$$E = mc^2$$

Corollary

$$x + y = y + x$$

Proof.

$$\omega + \phi = \epsilon$$



Equation

$$\cos^3 \theta = \frac{1}{4} \cos \theta + \frac{3}{4} \cos 3\theta \quad (1)$$

Example (Theorem Slide Code)

```
\begin{frame}
\frametitle{Theorem}
\begin{theorem}[Mass--energy equivalence]
$E = mc^2$
\end{theorem}
\end{frame}
```

Slide without title.

Citing References

An example of the \cite command to cite within the presentation:

This statement requires citation [Smith, 2022, Kennedy, 2023].

Appendix

Appendix - Figures and Tables

Appendix - Data

Appendix - Data

Appendix - Definitions

Appendix - Definitions

Major global crisis periods (theoretical regimes) (Slide X):

No.	Period	Event	Source
1	2007 – 2009	Global Financial Crisis	How Exchange Rate Volatility Shapes Commodity Derivatives Market: Less
2	2010 – 2012	European Debt Crisis	How Exchange Rate Volatility Shapes Commodity Derivatives Market: Less
3	2014 – 2016	Oil Price Crash	How Exchange Rate Volatility Shapes Commodity Derivatives Market: Less
4	2020 – 2021	COVID-19 Pandemic	How Exchange Rate Volatility Shapes Commodity Derivatives Market: Less
5	2022 – present	Russia-Ukraine Conflict	How Exchange Rate Volatility Shapes Commodity Derivatives Market: Less

Table caption¹²

¹²See: XXX

Appendix - Definitions

Calculation deviations of USD Spot-Rate from PPP-values (Slide 4):

$$\text{PPP Deviation} = \frac{\text{Actual Exchange Rate} - \text{PPP Exchange Rate}}{\text{PPP Exchange Rate}} \times 100^{13}$$

¹³ See: <https://www.investopedia.com/terms/p/ppp.asp>

Appendix - Definitions

Calculation of main exchange rate types (Slide XX):

- Nominal effective exchange rate (NEER): Calculated as geometric trade-weighted averages of bilateral exchange rates.¹⁴
- Real effective exchange rates (REER): Derived by adjusting the NEER by relative consumer prices.¹⁵
- Nominal exchange rates (NER): The exchange rate between two currencies without adjustment for inflation.¹⁶
- Real exchange rates (RER): The nominal exchange rate adjusted for differences in price levels between countries.¹⁷

¹⁴ See: <https://data.bis.org/topics/EER>

¹⁵ See: <https://data.bis.org/topics/EER>

¹⁶ See:

¹⁷ See:

References

References - Literature



John Smith (2022)

Publication title

Journal Name 12(3), 45 – 678.



Annabelle Kennedy (2023)

Publication title

Journal Name 12(3), 45 – 678.

References - Data



John Smith (2022)

Publication title

Journal Name 12(3), 45 – 678.



Annabelle Kennedy (2023)

Publication title

Journal Name 12(3), 45 – 678.

List of Figures

- Figure2: Global Oil Production and Consumption (Slide6)
- Figure??: Global Coal Production and Consumption (Slide??)

Thank you for your attention!

We await your Questions and/or Comments.

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Public GitHub Project Repository: <https://github.com/RobertHennings>

Discussion

- ① Have you expected this outcome?
- ② What do you think about the dynamics?
- ③ What other variables could be potentially included?



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Further Material for Illustrations - Questions