# Application of RBF Neural Networks

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# Outline

# Motivation

- **Definition**:
  A neural network is a nonlinear system that maps input variables $x_1, ..., x_p$ onto output variables $y_1, ..., y_q$,i.e it is a nonlinear function

$$\nu : R^p \longrightarrow R^q$$

$$(y_1, ..., y_q) = \nu(x_1, ..., x_p).$$

- If one use symmetric kernel functions, e.g. normal-CDF, in this case we speak about RBF-networks.

- **Objectives**:
  - ✓ Quantify the risk of an asset using nonlinear $AR(p) - ARCH(q)$ model
  - ✓ Estimate the conditional volatility using RBF neaural network, which could be seen as a good meassurement for risk
  - ✓ Illustrate the application of Neural Networks

# Methodology

- QuantNet-open access code-sharing platform
- Quantlet-statistics-related document and program code
- Nonlinear $AR(p) - ARCH(q)$ model and RBF neural network

# Data

**Data Set**:

- BP/USD
- Jerman 10 year bond yields
- gold Krugerrand (SF/Oz)
- Commerzbank stocks

**Remark**:The time interval of the 4 series data is from May.8th,2005 to July.8th,2016, counting for 2895 observations.

# Emprical Results

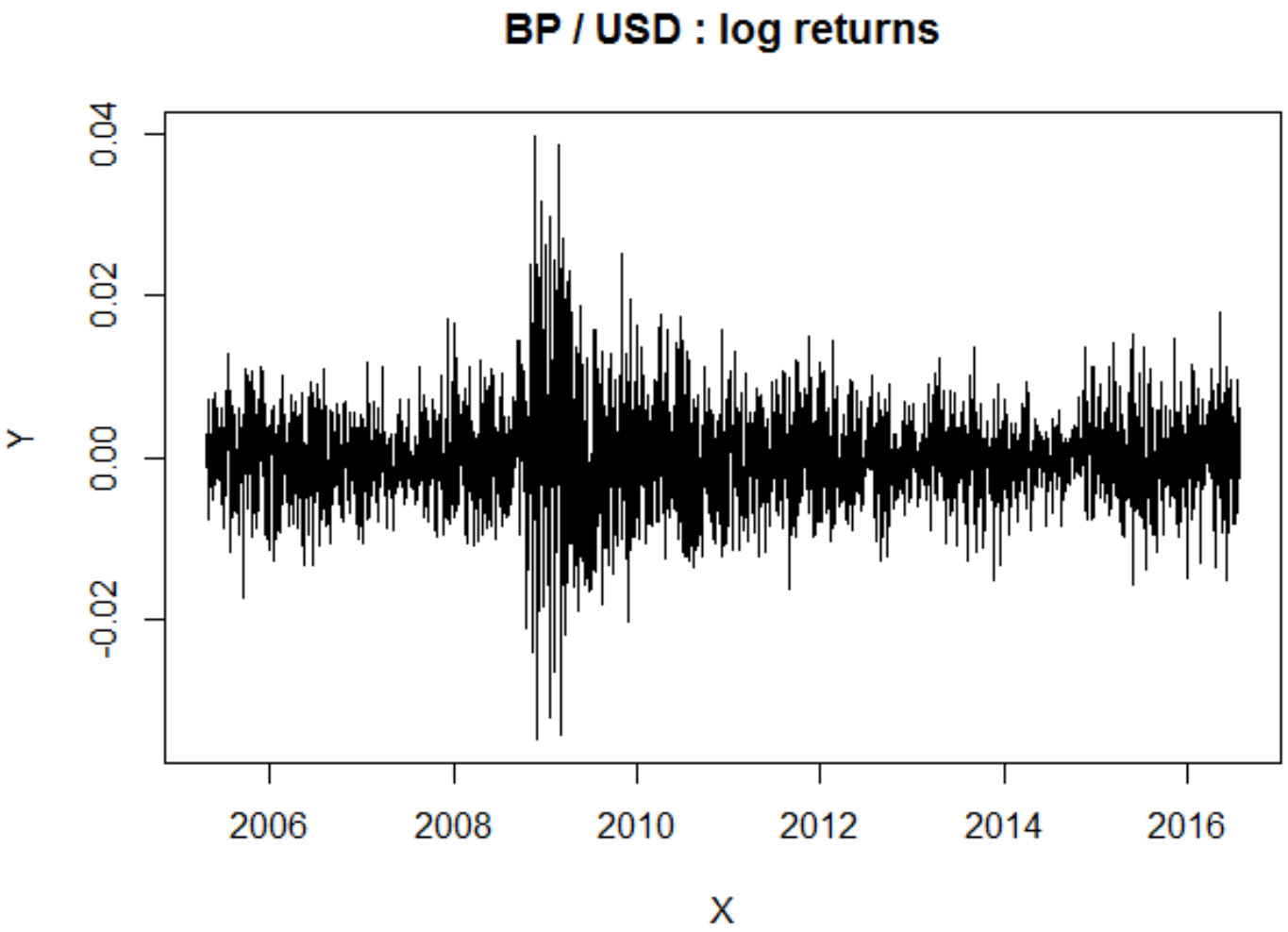


**Figure 1**

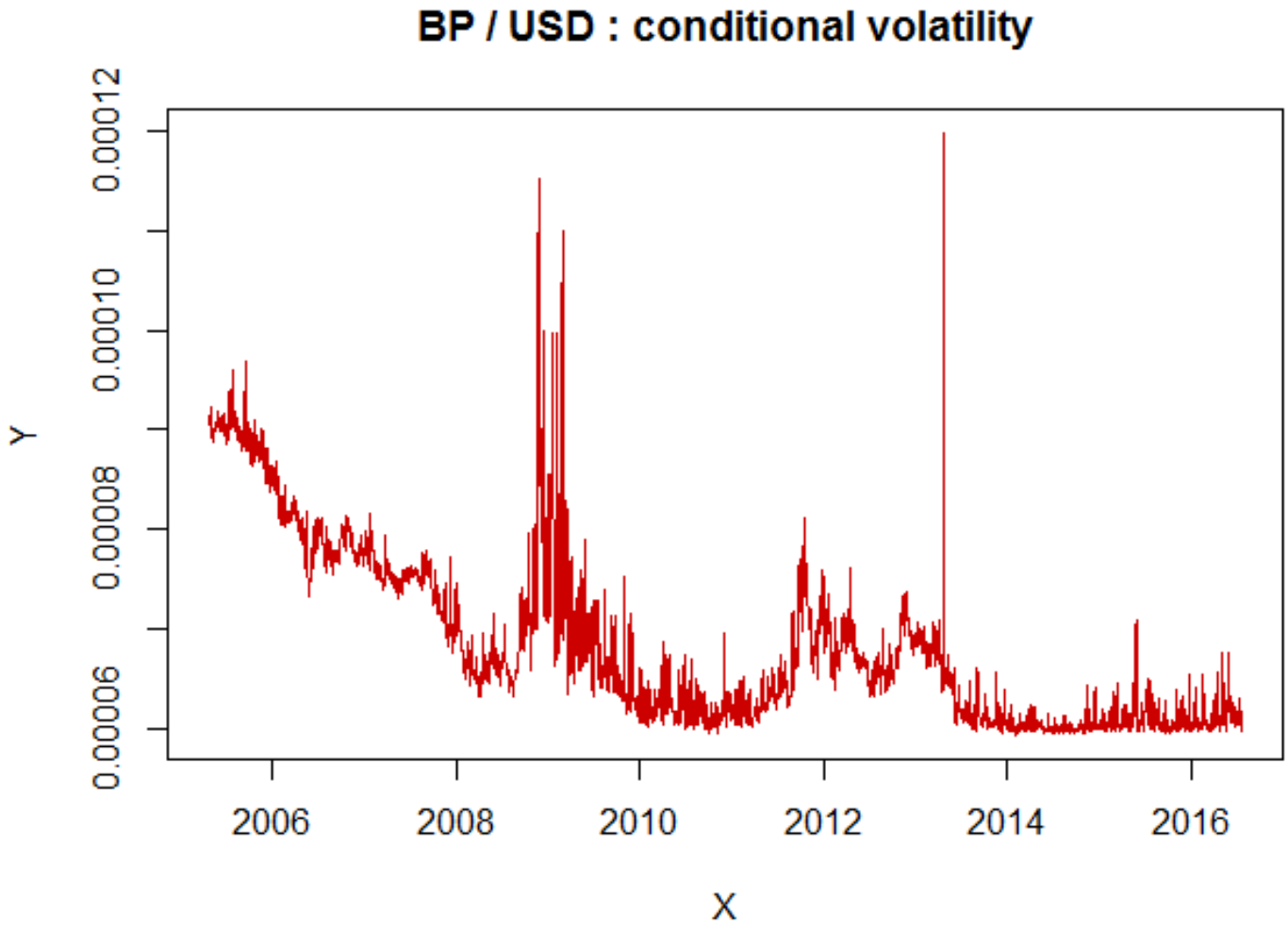
BP / USD : conditional volatility
Y
0.00006
0.00008
0.00010
0.00012
2006
2008
2010
2012
2014
2016
X

**Figure2**

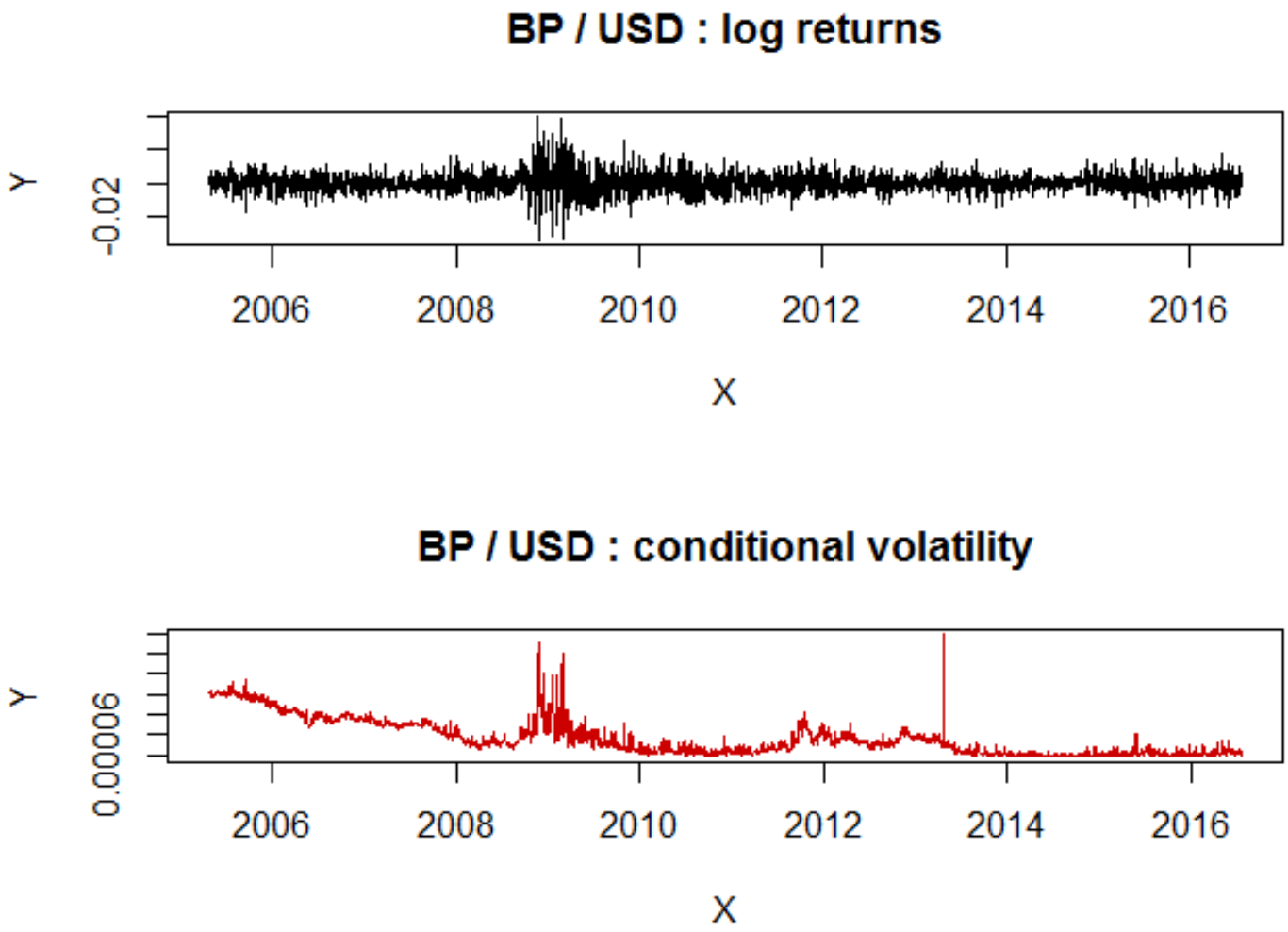
BP / USD : log returns
Y
-0.02
2006
2008
2010
2012
2014
2016
X
BP / USD : conditional volatility
Y
0.00006
2006
2008
2010
2012
2014
2016
X

**Figure3**

# Conclusions

- The log return of BP/USD volatiled heavily around the year 2009(after the crisis)
- The corresponding estimated conditional volatility of BP/USD is large around the year 2009
- The estimated conditional volatility of BP/USD has a decline trend

**Conclusion**:The conditional volatility, estimated using RBF neural network, is consistent with the real data of BP/USD.

# Thanks!