VGK Data Descriptive Analysis

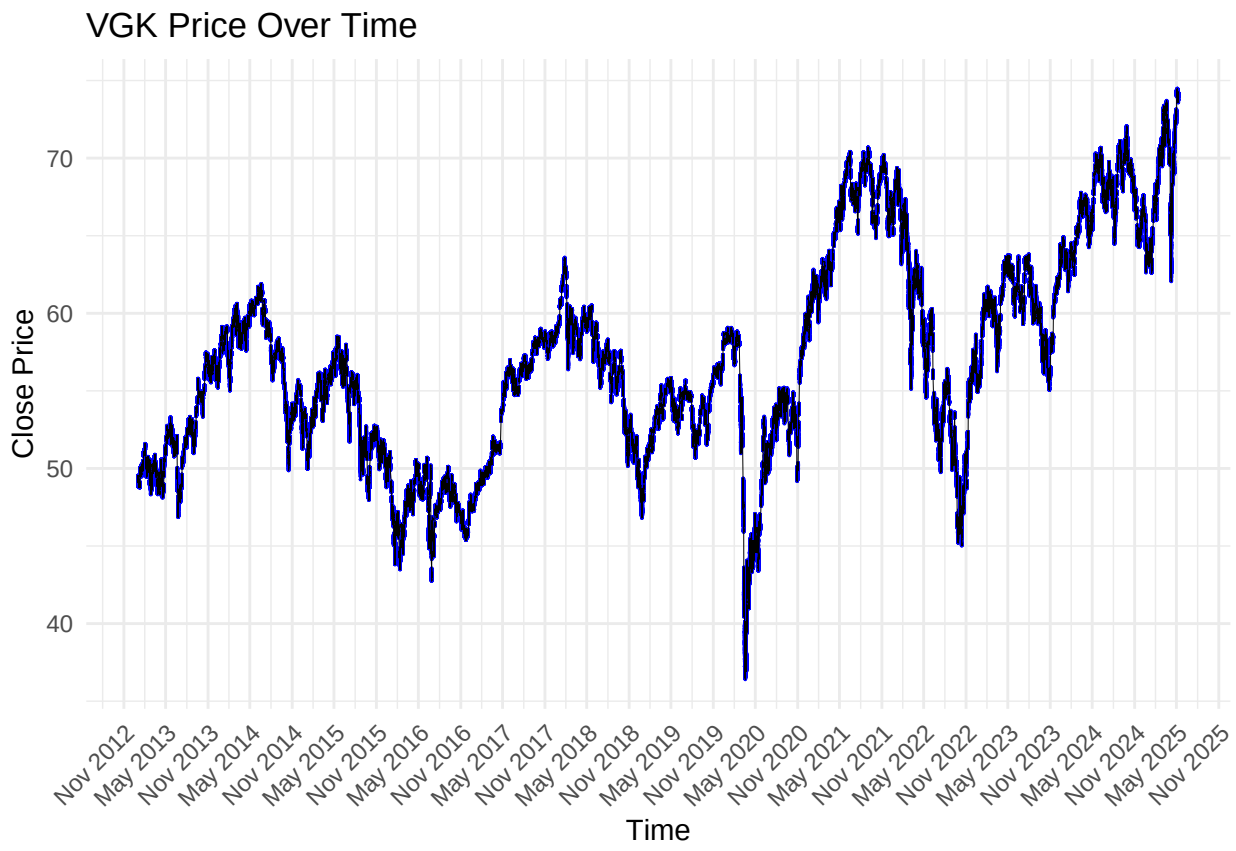
Contents

Price

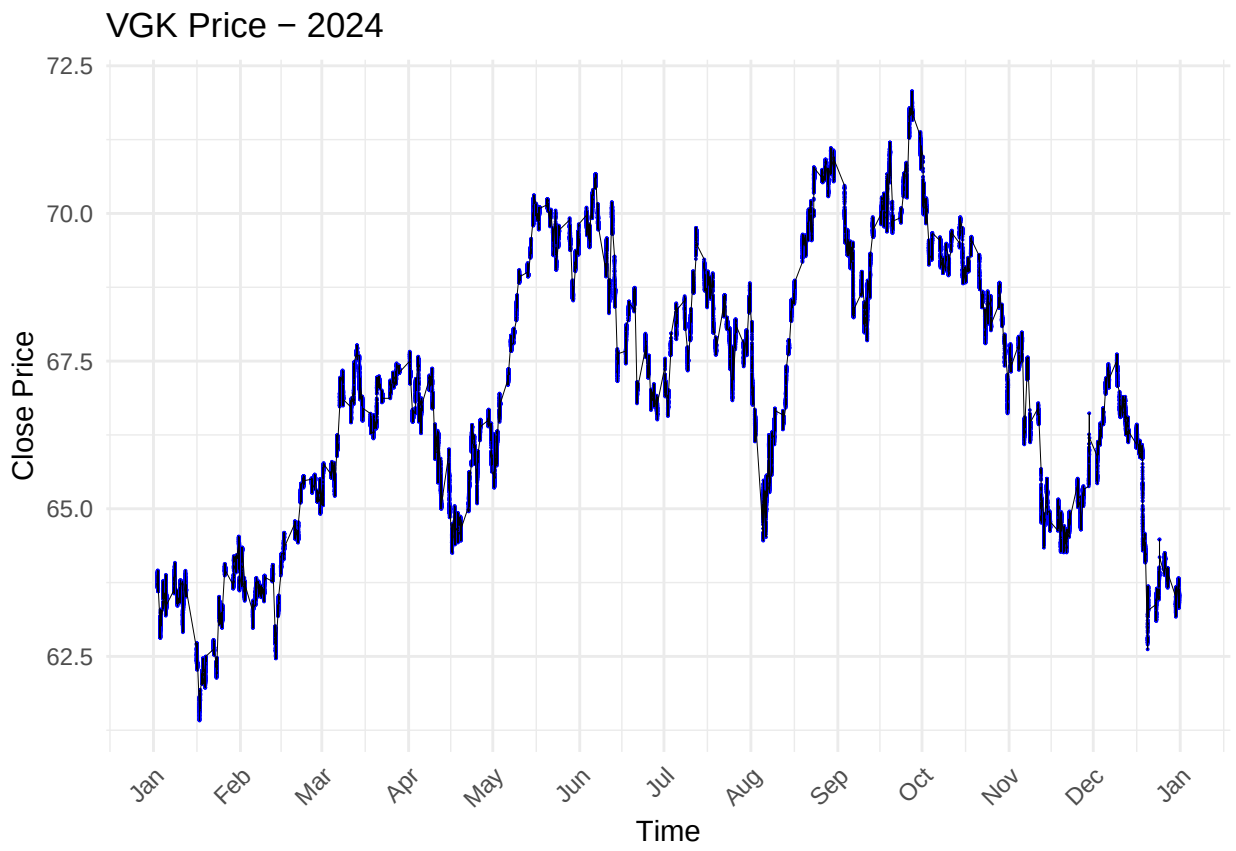
Here we provide some descriptive facts about our financial data on VGK prices.

Plots

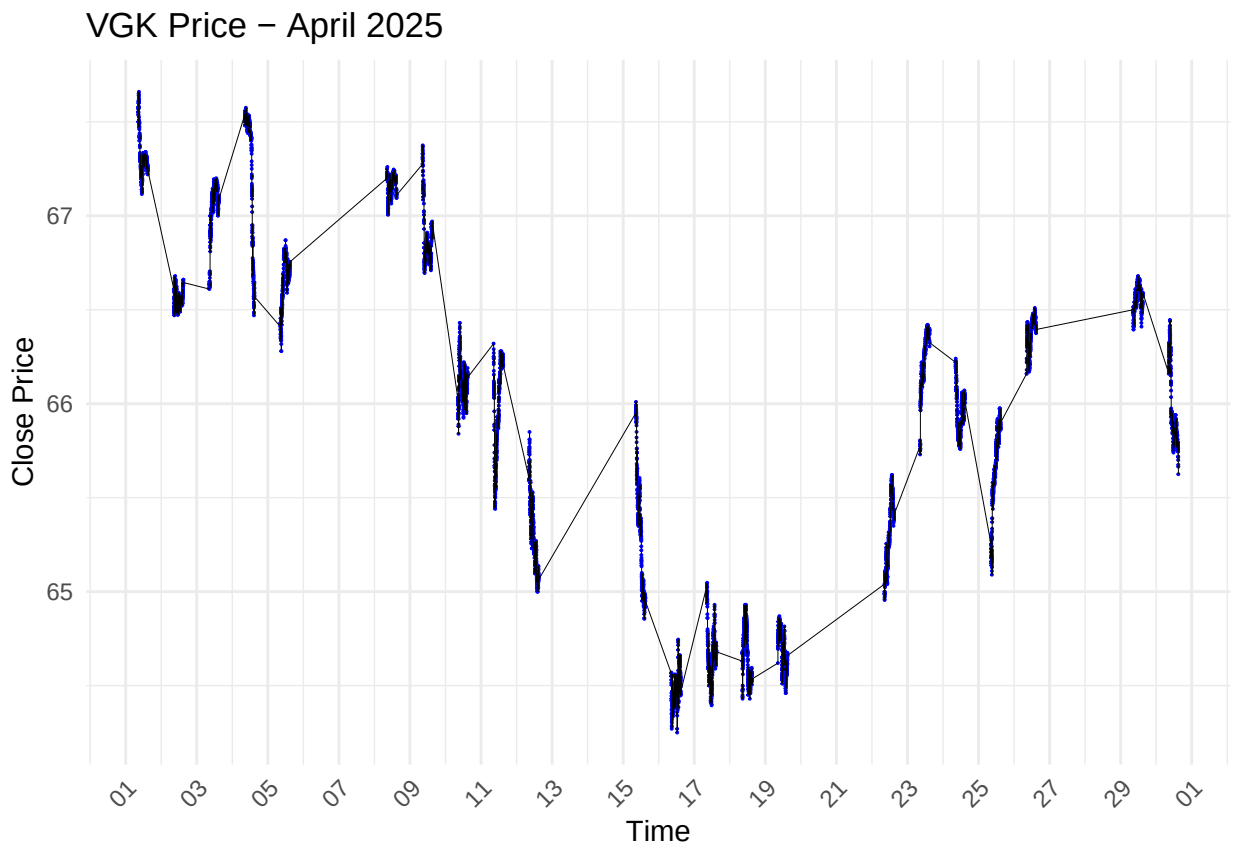
```
#All Time
price_plotter(raw_VGK,"VGK Price Over Time")
```




```
#2024
VGK_2024 = year_selector(raw_VGK,2024)
price_plotter_year(VGK_2024,"VGK Price - 2024")
```




```
#April 2025
VGK_2025_04 = month_selector(raw_VGK,2024,04)
price_plotter_month(VGK_2025_04,"VGK Price - April 2025")
```

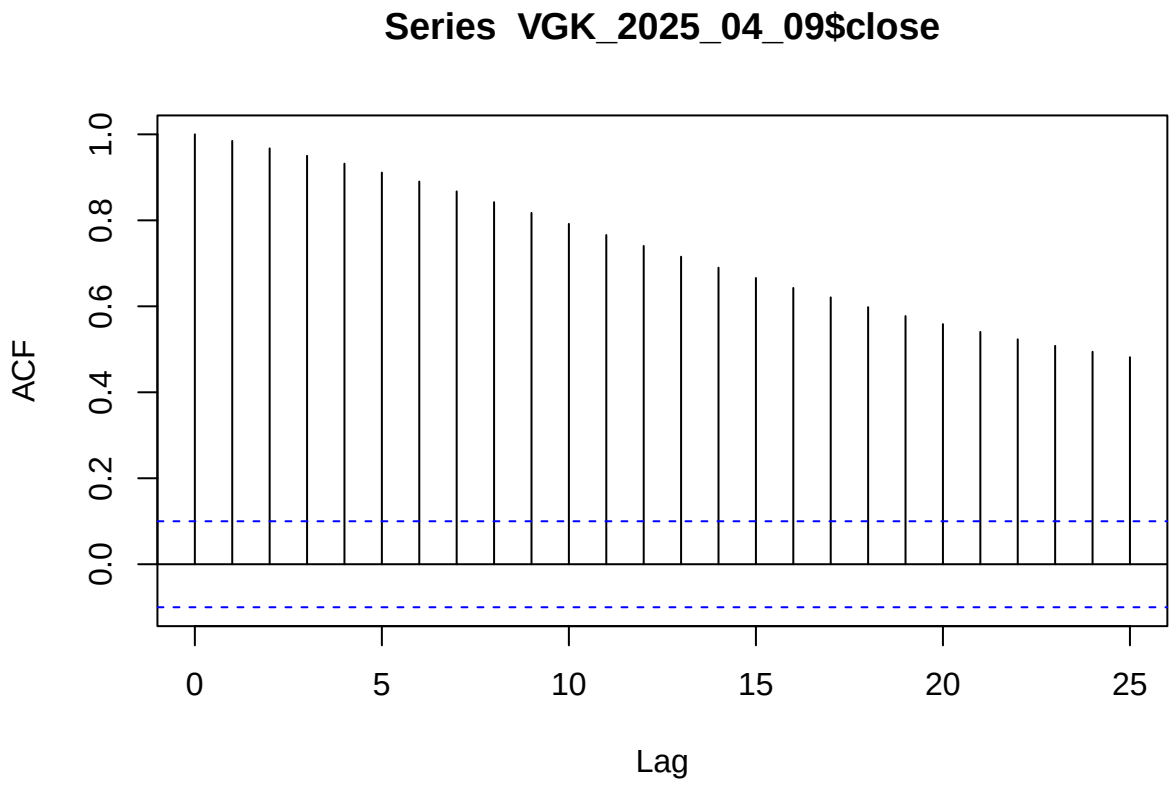



```
#9th of April 2025
VGK_2025_04_09 = day_selector(raw_VGK,2024,04,09)
price_plotter_day(VGK_2025_04_09,"VGK Price - 9th of April 2025")
```

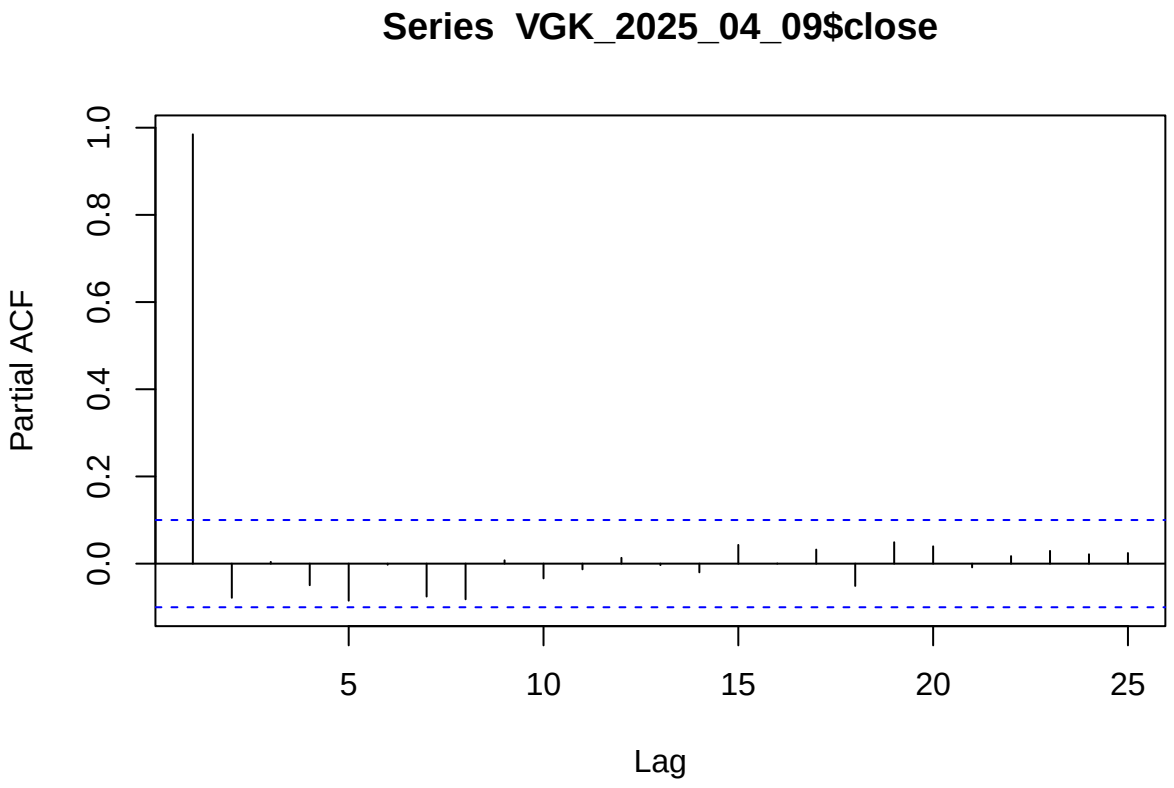
Time Series Analysis

This is not at all related to our final analysis. It is just in order to see the financial data on its own and how it behaves as a time series.

```
acf(VGK_2025_04_09$close)
```




```
pacf(VGK_2025_04_09$close)
```




```
AR1 = arima(VGK_2025_04_09$close,c(1,0,0),method="ML")
AR2 = arima(VGK_2025_04_09$close,c(2,0,0),method="ML")
AR3 = arima(VGK_2025_04_09$close,c(3,0,0),method="CSS")
table1 = export_summs(AR1,AR2,AR3, model.names = c("AR1","AR2","AR3"), digits = 4)
huxtable::caption(table1) <- "AR Estimations"
huxtable::set_width(table1, 0.8)
```

```
AR1res = as.numeric(AR1$residuals)
AR1res_lagged <- lag(AR1res, 1)
iidcheck1 = lm(AR1res ~ AR1res_lagged)
AR2res = as.numeric(AR2$residuals)
AR2res_lagged <- lag(AR2res, 1)
iidcheck2 = lm(AR2res ~ AR2res_lagged)
AR3res = as.numeric(AR3$residuals)
AR3res_lagged <- lag(AR3res, 1)
iidcheck3 = lm(AR3res ~ AR3res_lagged)
table2 = export_summs(iidcheck1,iidcheck2,iidcheck3,
             model.names = c("AR1 Residuals","AR2 Residuals","AR3 Residuals"),
             digits = 4)
huxtable::caption(table2) <- "Checking Residuals"
huxtable::set_width(table2, 0.8)
```

Table 1: AR Estimations

	AR1	AR2	AR3
ar1	0.9964	1.0562	1.0355
	(0.0034)	(0.0512)	(0.0510)
intercept	66.9997	66.9947	66.8277
	(0.1528)	(0.1454)	(0.0550)
ar2		-0.0602	-0.0247
		(0.0513)	(0.0731)
ar3			-0.0267
			(0.0503)
nobs	384	384	384
sigma	0.0166	0.0166	0.0163
logLik	1026.0693	1026.7507	
AIC	-2046.1385	-2045.5015	
BIC	-2034.2866	-2029.6989	
nobs.1	384.0000	384.0000	384.0000

*** p < 0.001; ** p < 0.01; * p < 0.05.

Realised Volatility

Computations

```
#avg per day for each month of any dataset
vol_VGK_daily = r.vol_daily(raw_VGK,merge=F)
head(vol_VGK_daily)
```

```
#can then filter out years, months, or days
vol_24d = year_selector(vol_VGK_daily,2024)
vol_24_08d = month_selector(vol_VGK_daily,2024,08)
vol_24_11_04d = day_selector(vol_VGK_daily,2024,11,04) #scalar


#avg per hour for each day of each month of any dataset
vol_VGK_hourly = r.vol_hourly(raw_VGK,merge=F)
head(vol_VGK_hourly)
```

Table 2: Checking Residuals

	AR1 Residuals	AR2 Residuals	AR3 Residuals
(Intercept)	-0.0012	-0.0012	-0.0000
	(0.0008)	(0.0008)	(0.0008)
AR1res_lagged	0.0588		
	(0.0510)		
AR2res_lagged		-0.0030	
		(0.0511)	
AR3res_lagged			-0.0007
			(0.0513)
N	383	383	383
R2	0.0035	0.0000	0.0000

*** p < 0.001; ** p < 0.01; * p < 0.05.

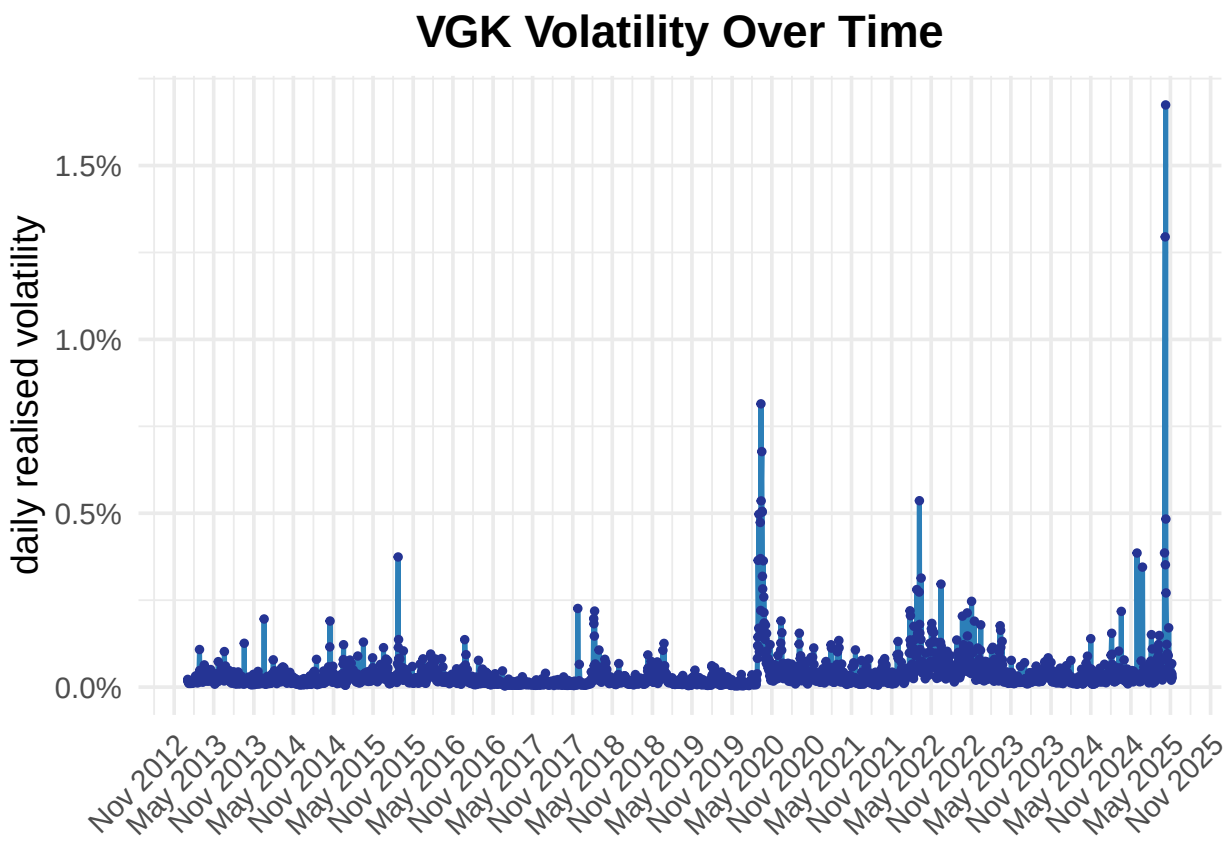
timestamp	r__vol__d
2013-01-02	0.000222
2013-01-03	0.000164
2013-01-04	0.000175
2013-01-07	0.000116
2013-01-08	0.000106
2013-01-09	0.000124

```
#can then filter out years, months, or days
vol_24h = year_selector(vol_VGK_hourly,2024)
vol_24_08h = month_selector(vol_VGK_hourly,2024,08)
vol_24_11_04h = day_selector(vol_VGK_hourly,2024,11,04) #vector
```

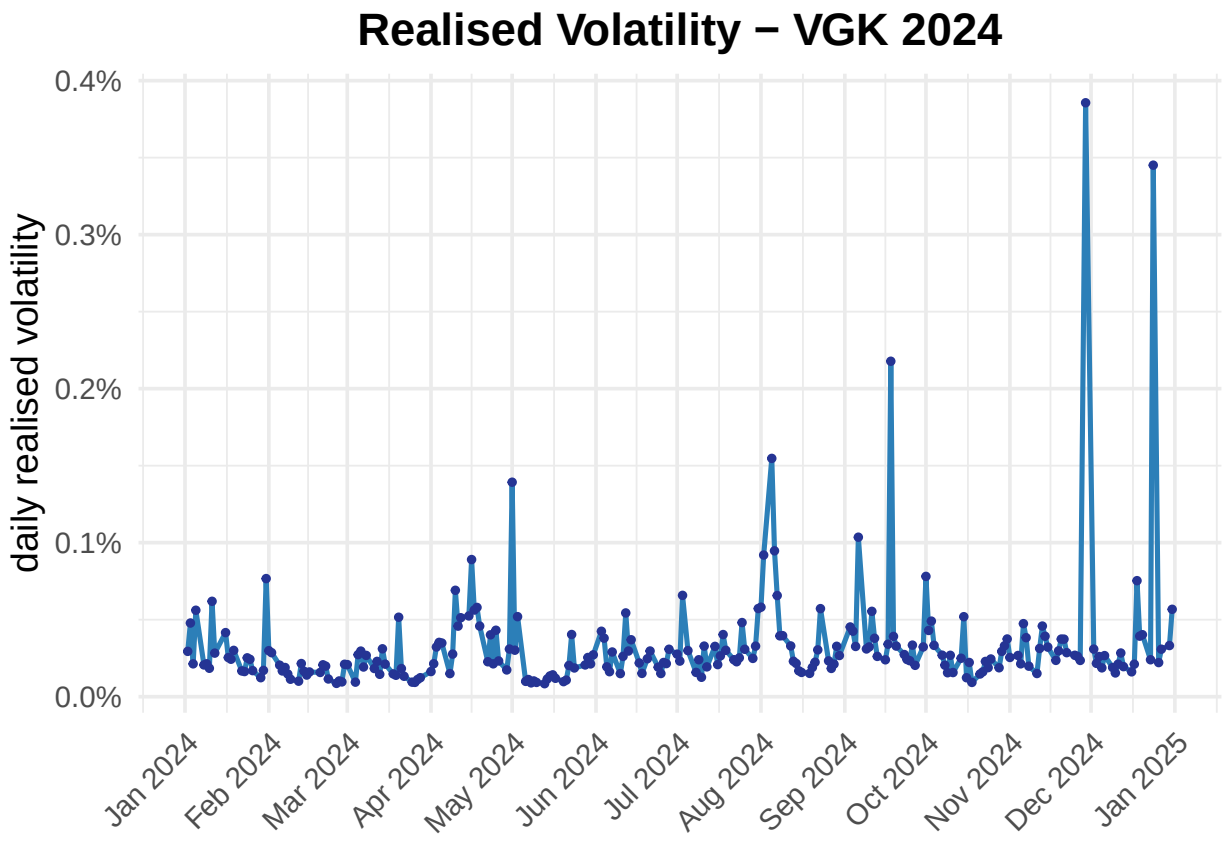
Plots

```
#avg per day volatility all time
dvol_plotter(vol_VGK_daily,breaks="yearly",
             title="VGK Volatility Over Time")
```

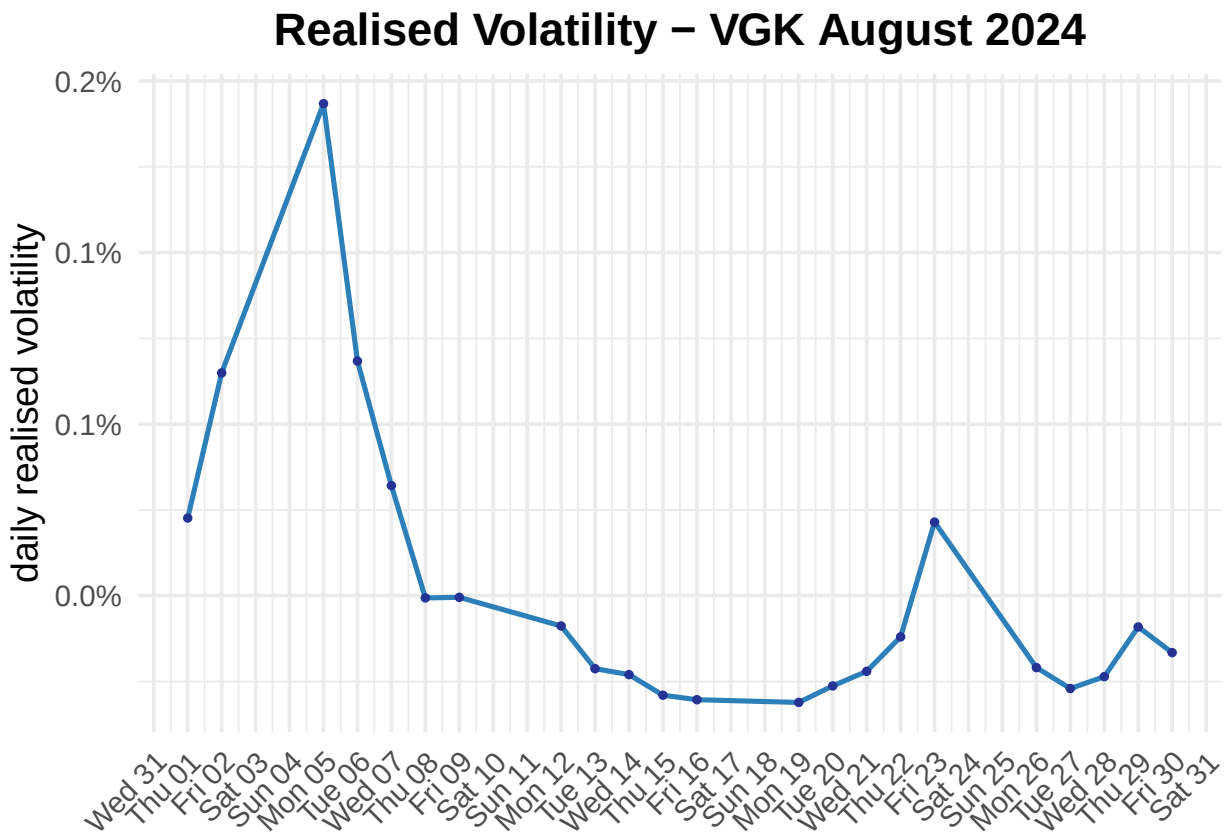
timestamp	r__vol__h
2013-01-02 09:00:00	0.000308
2013-01-02 10:00:00	0.000241
2013-01-02 11:00:00	0.000466
2013-01-02 12:00:00	0.000194
2013-01-02 13:00:00	0.000103
2013-01-02 14:00:00	0.000189



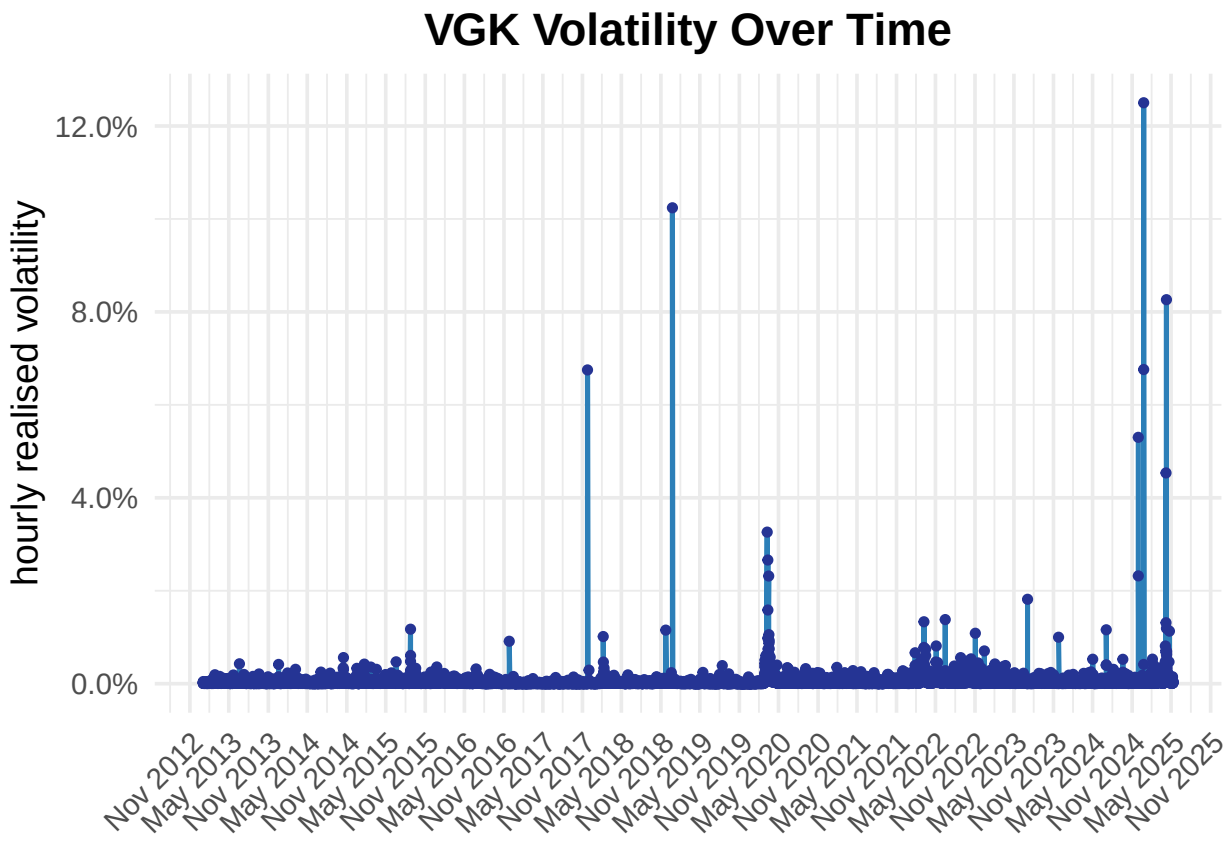

```
#avg per day volatility in a year
dvol_plotter(vol_24d,breaks="monthly",
             title="Realised Volatility - VGK 2024")
```



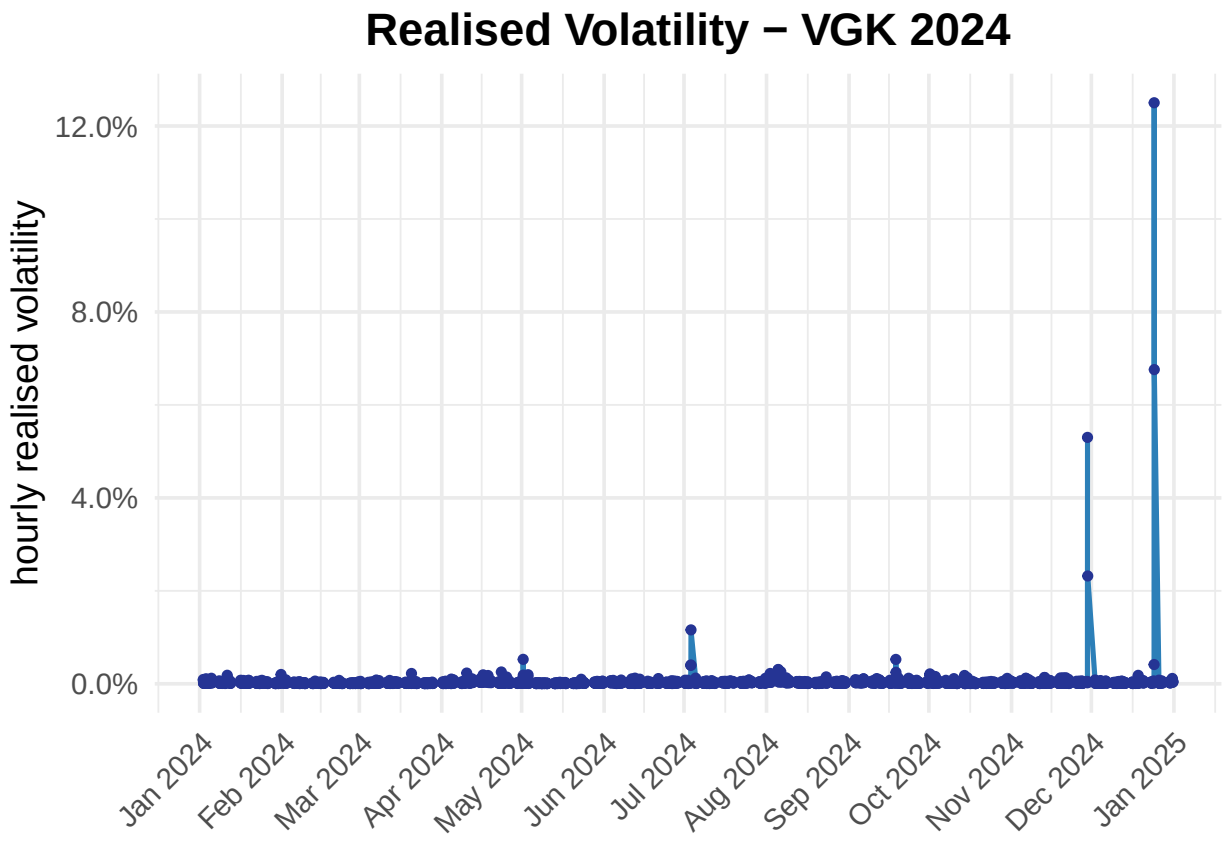

```
#avg per day volatility in a month
dvol_plotter(vol_24_08d,breaks="daily",
             title="Realised Volatility - VGK August 2024")
```



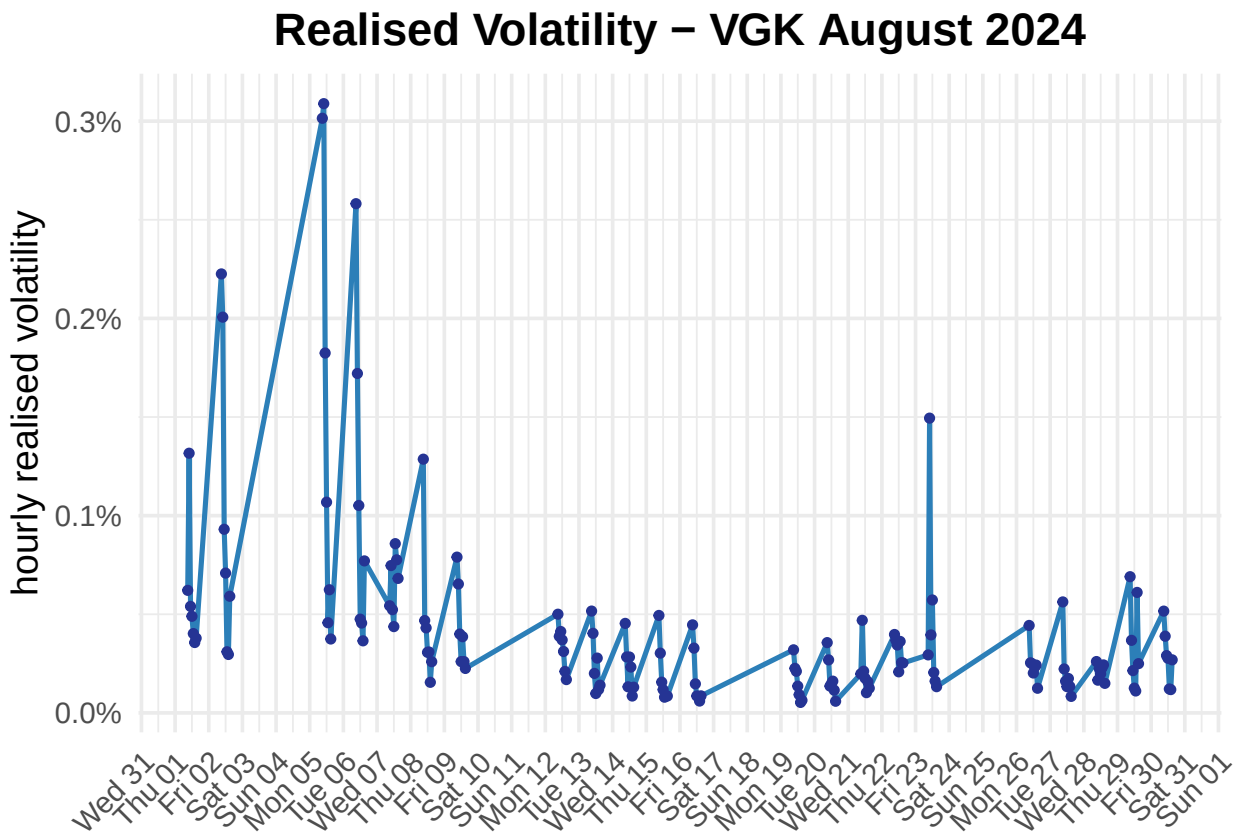

```
#hourly volatility all time
hvol_plotter(vol_VGK_hourly,breaks="yearly",
             title="VGK Volatility Over Time")
```



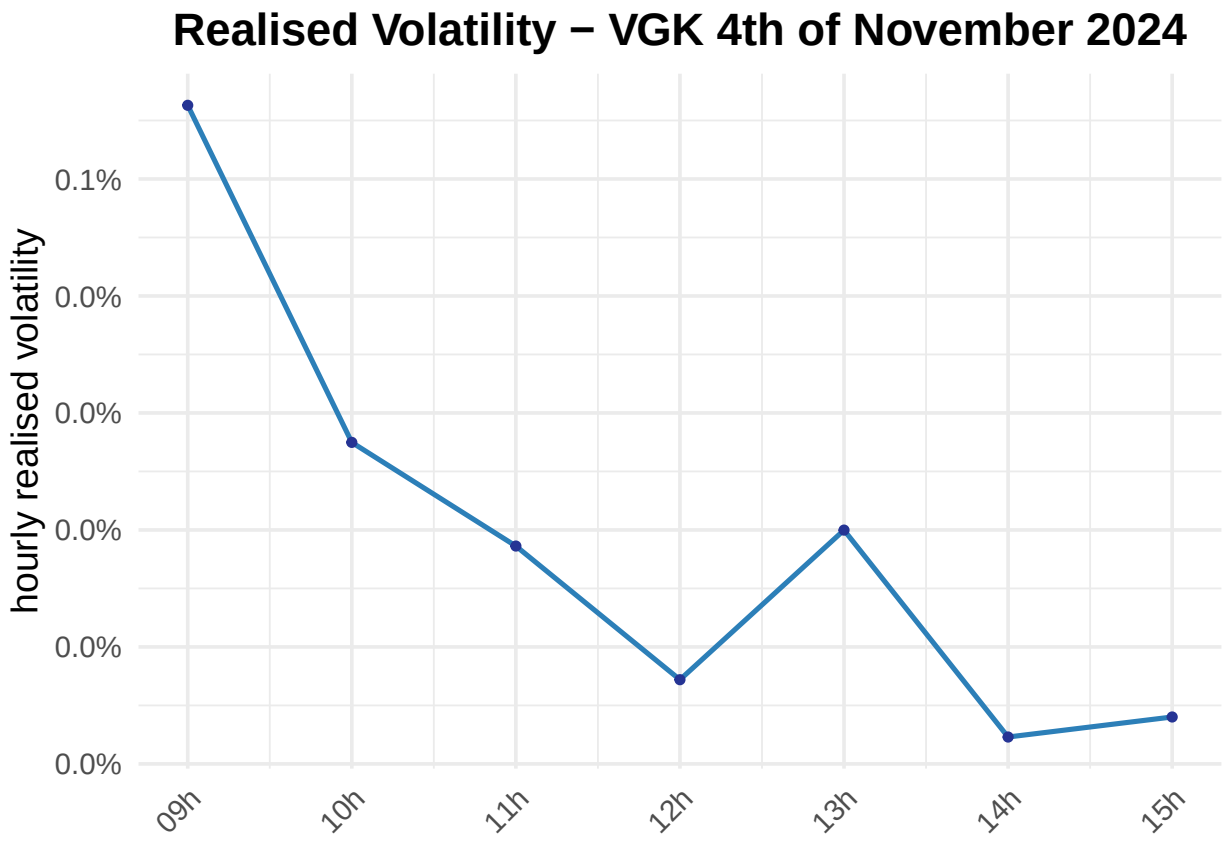

```
#hourly volatility in a year
hvol_plotter(vol_24h,breaks="monthly",
             title="Realised Volatility - VGK 2024")
```




```
#hourly volatility in a month
hvol_plotter(vol_24_08h,breaks="daily",
             title="Realised Volatility - VGK August 2024")
```




```
#hourly volatility in a day
hvol_plotter(vol_24_11_04h,breaks="hourly",
             title="Realised Volatility - VGK 4th of November 2024")
```


Realised Volatility − VGK 4th of November 2024
hourly realised volatility
0.1%
0.0%
0.0%
0.0%
0.0%
09h
10h
11h
12h
13h
14h
15h