RTP Exercise Series 1

Jonas Zürcher

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Exercise 1.1

a) Sunshine duration per month in Basel from 1990 to 2000.

Time period = 11 years (start = 1990 , end = 2000) time step = 1 month, (frequency = 12 or deltat = 1/12)

b) Number of newborn babies in the city of Zurich per year from 2000 to 2011.

Time period = 12 years (start = 2000, end = 2011) time step = 1 year, (frequency = 1 or deltat = 1)

c) Number of reservations in a restaurant for every night during 4 weeks.

Time period = 4 weeks (start = day 1, end = last day of the 4 weeks), time step = 1 day (frequency = 365 or deltat = 1/365)

d) Water runoff of a river. The data has been colected every day for 4 years.

Time period = 4 years (start = day 1, end last day of the 4 years), time step = 1 day(frequency = 365 or deltat = 1/365)

Exercise 1.2

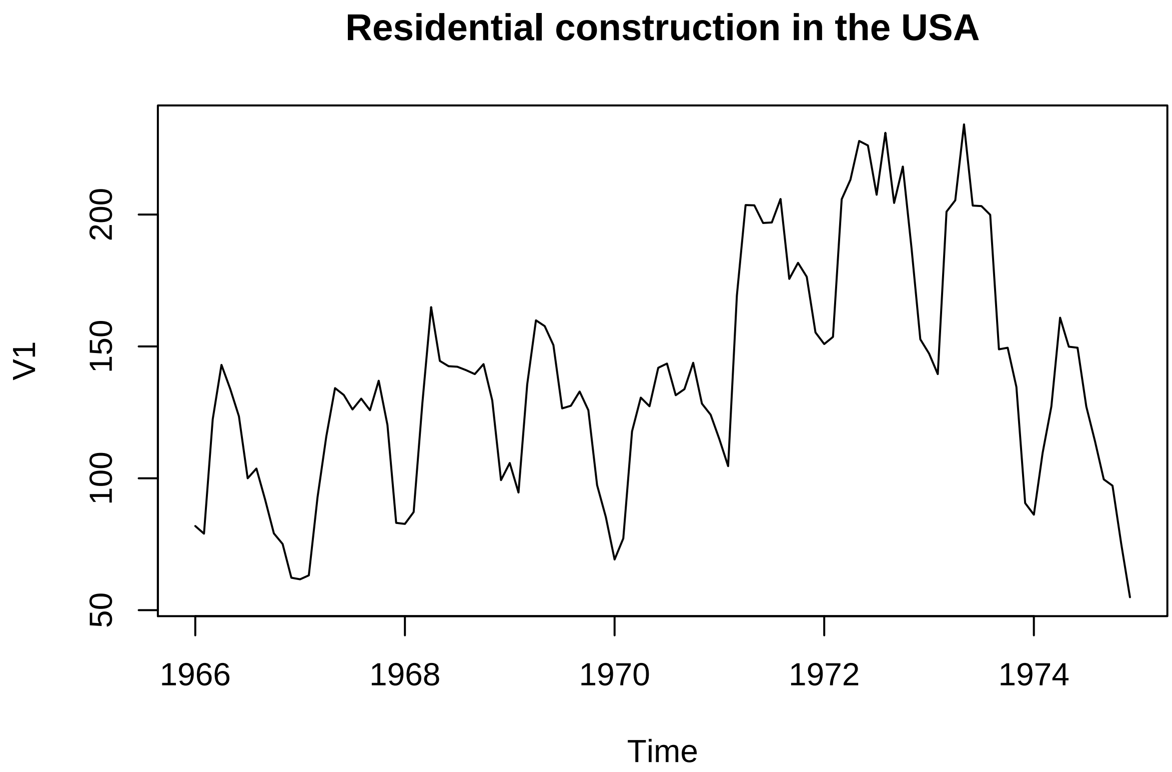
Import data

```
hstart <-read.table("hstart.dat")
head(hstart)
```

```
##      V1
## 1  81.9
## 2  79.0
## 3 122.4
## 4 143.0
## 5 133.9
## 6 123.5
```

Plot data

```
ts.dat<-ts(data=hstart,
           start=c(1966,1),
           end=c(1974,12),
           frequency=12)
plot(ts.dat,main="Residential construction in the USA")
```



Linear trends and seasonality is observable in the plot. Therefore i would conclud that this time series is non-stationary.

Exercise 1.3

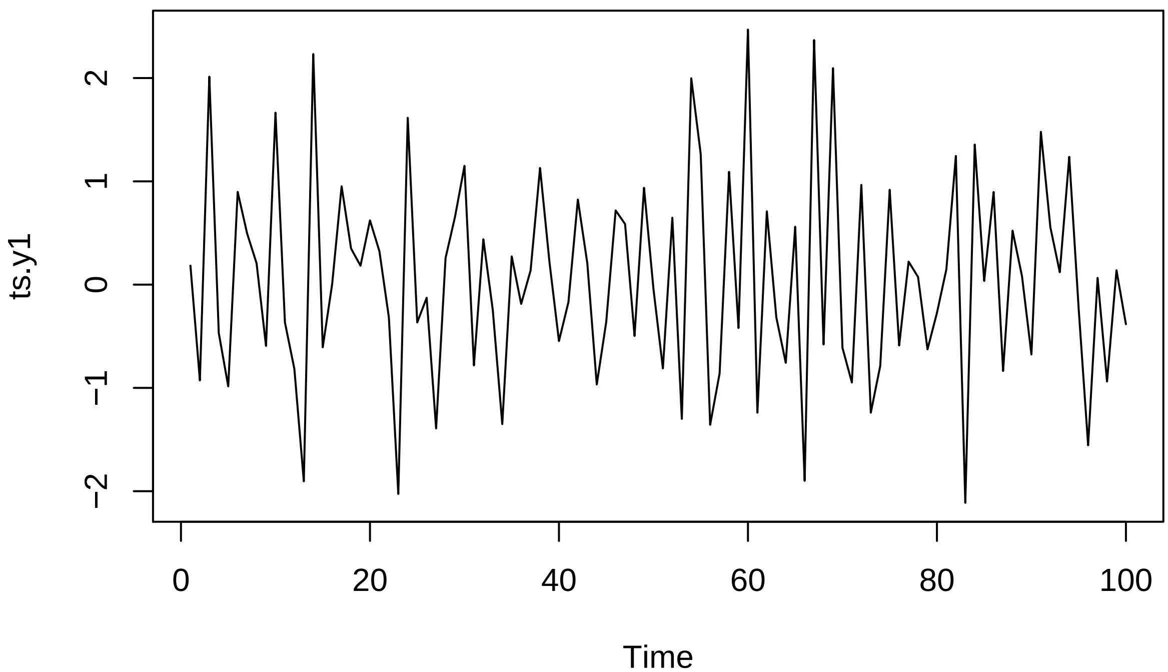
1.3 a)

Code

```
set.seed(1)
Et <- ts(rnorm(101, 0, 1))
Et[1] <- 0
y1 <- 0 #delete later
for (i in 2:length(Et)) {
y1[i] <- Et[i]-0.5*Et[i-1]
}
y1 = y1[2:length(y1)]
ts.y1 = ts(y1)
```

Plot

```r
plot(ts.y1)
```



Interpretation

There is a high chance that this time series is stationary. Because the value distribuation is the same for all values. Furthermore the variance is the same for all values

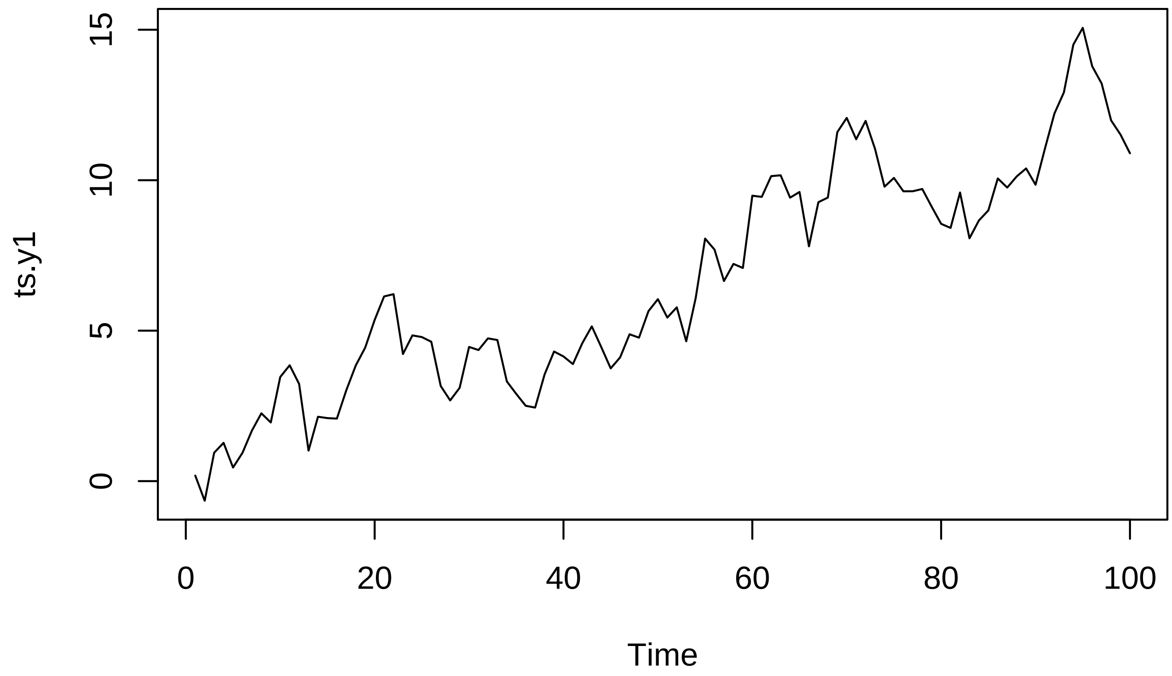
1.3 b)

Code

```r
set.seed(1)
Et <- ts(rnorm(101, 0, 1))
Et[1] <- 0
y1 <- 0 #delete later
for (i in 2:length(Et)) {
y1[i] <- y1[i-1]+Et[i]
}
y1 = y1[2:length(y1)]
ts.y1 = ts(y1)
```

Plot

```
plot(ts.y1)
```



Interpretation

There is a high chance that this time series is not stationary. Because there is a linear trend.

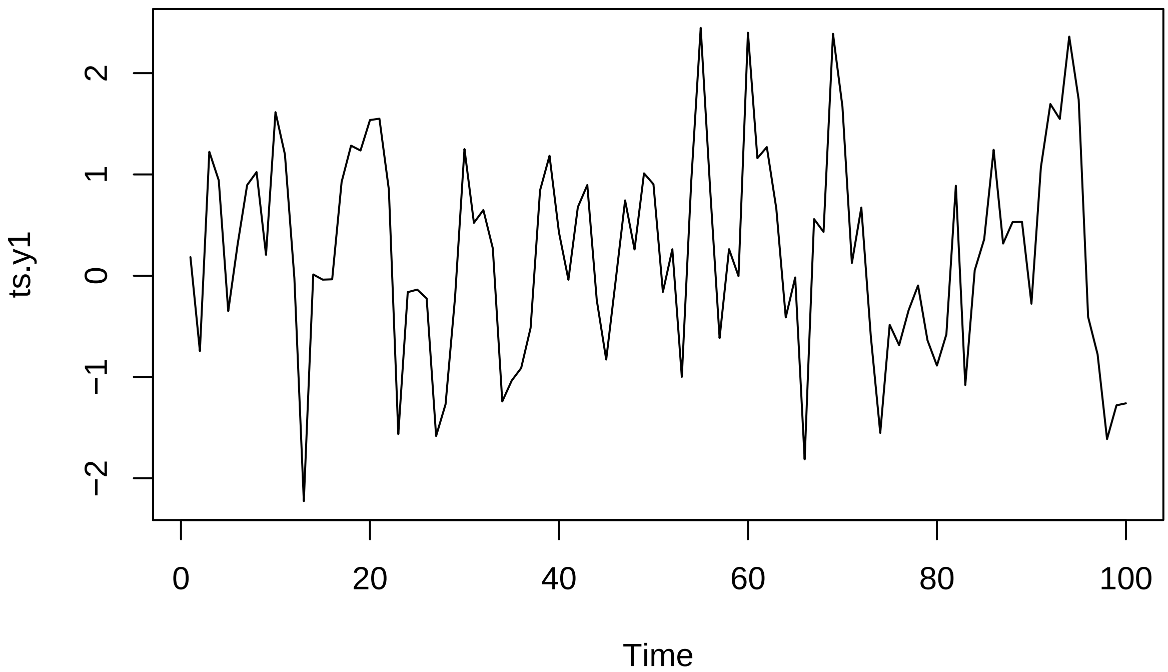
1.3 c)

Code

```
set.seed(1)
Et <- ts(rnorm(101, 0, 1))
Et[1] <- 0
y1 <- 0 #delete later
for (i in 2:length(Et)) {
y1[i] <- 0.5*y1[i-1]+Et[i]
}
y1 = y1[2:length(y1)]
ts.y1 = ts(y1)
```

Plot

```r
plot(ts.y1)
```



Interpretation

There is a high chance that this time series is not stationary. Because the variance changes over time.

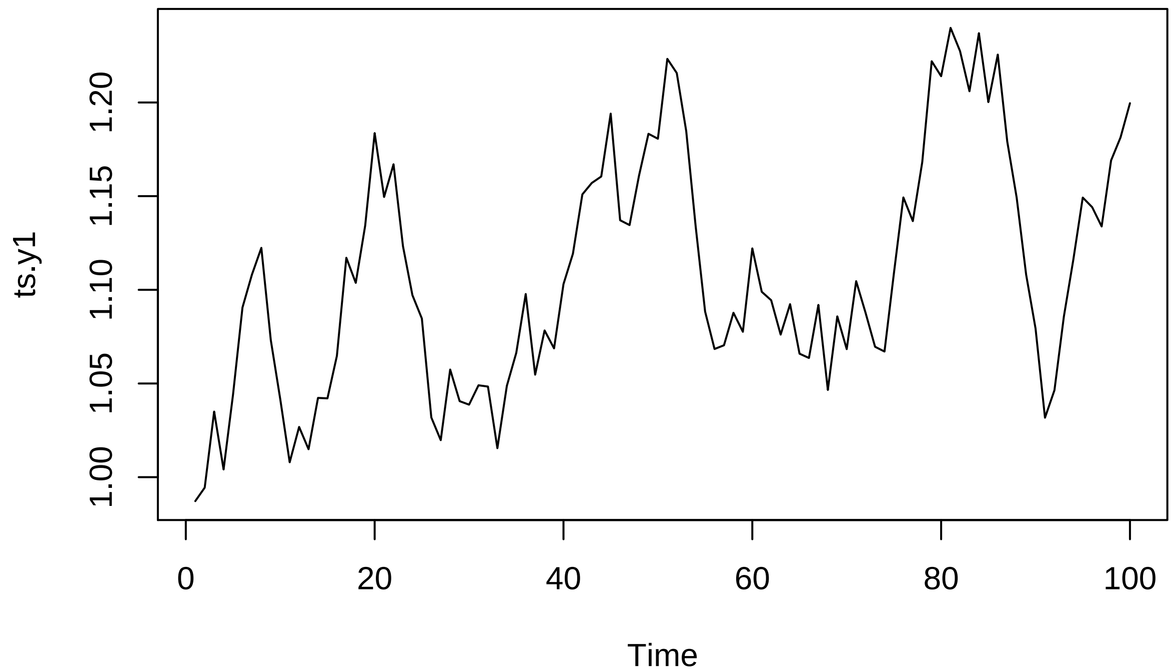
1.3 d)

Code

```r
set.seed(1)
Et <- ts(runif(101, 0.95,1.05))
Et[1] <- 0
y1 <- 1 #delete later
for (i in 2:length(Et)) {
y1[i] <- y1[i-1]*Et[i]
}
y1 = y1[2:length(y1)]
ts.y1 = ts(y1)
```

Plot

```r
plot(ts.y1)
```



Interpretation

There is a high chance that this time series is not stationary. Because there is a linear trend and seasonality present.