Exercise 4

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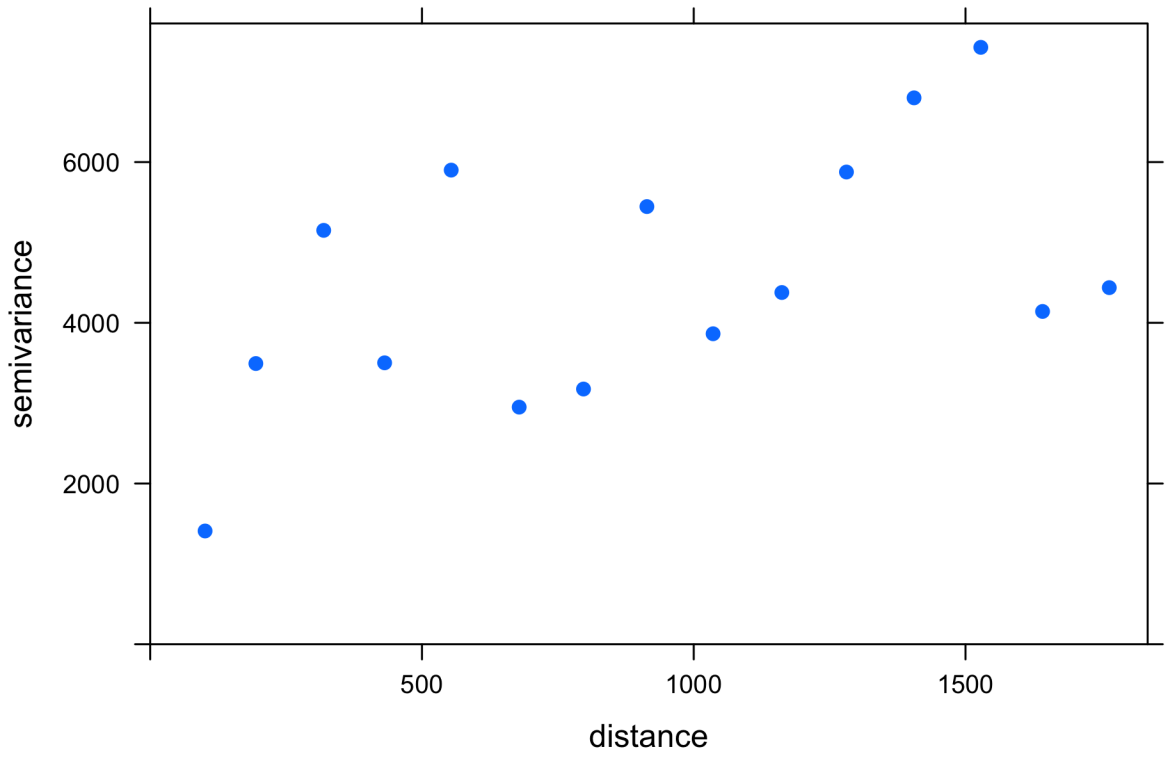
Contents

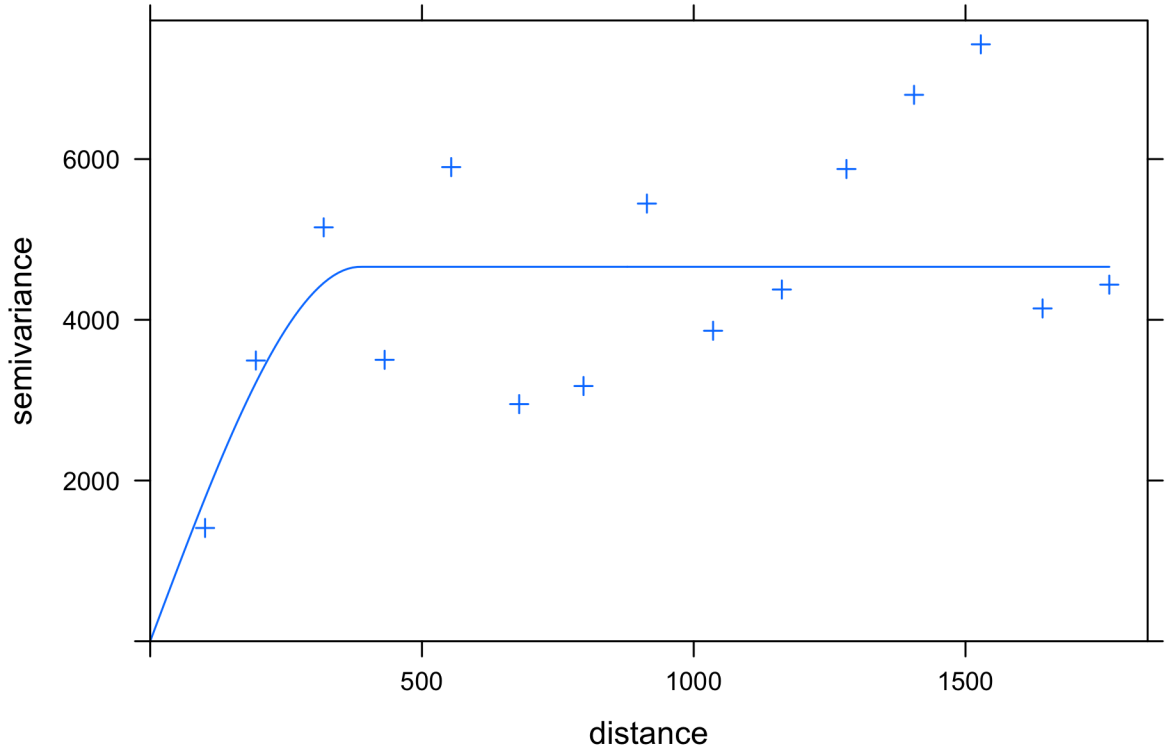
1 Introduction

1.1 Point A

Our model is now

$$y(s_i) = a_0 + \delta(s_i)$$






```
## [generalized least squares trend estimation]
## [1] 263.5391
```

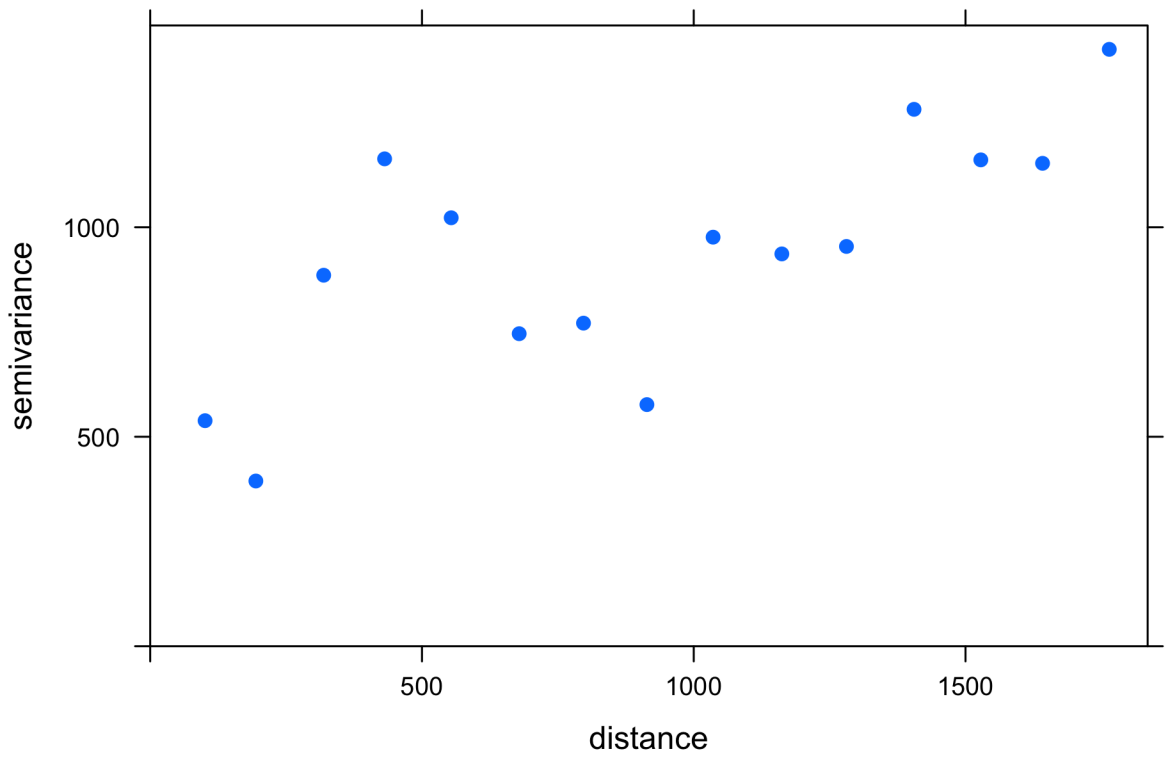
a_0 is 263.5391.

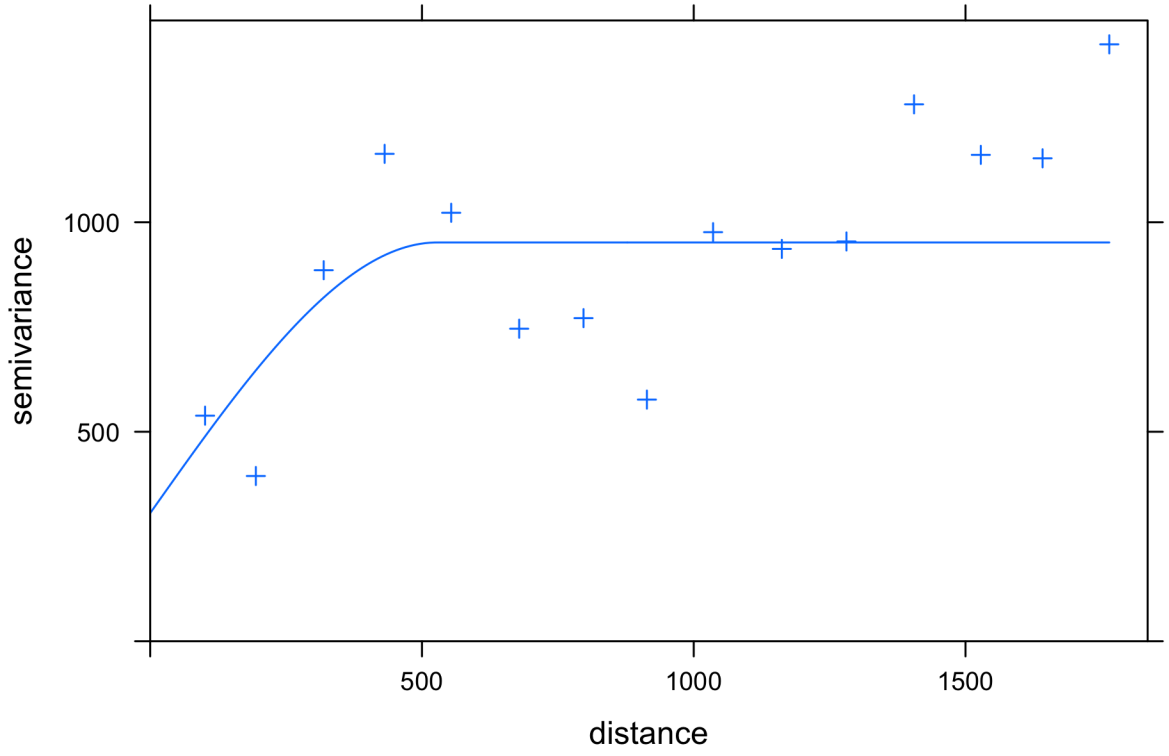
1.2 Point B

Our model is now

$$y(s_i) = a_{0,g} + a_{1,g} \cdot d(s_i) + \delta(s_i) \quad g = 1, 2$$

We have to estimate 4 coefficients.


semivariance
1000
500
500
1000
1500
distance



Strategy to estimate coefficients.

We can consider two observations and solve a linear system.

Winter

$$\begin{cases} y_{pred}(s'_{\texttt{winter}}) = a_{0,\texttt{winter}} + a_{1,\texttt{winter}} \cdot d(s'_{\texttt{winter}}) \\ y_{pred}(s''_{\texttt{winter}}) = a_{0,\texttt{winter}} + a_{1,\texttt{winter}} \cdot d(s''_{\texttt{winter}}) \end{cases}$$

Not winter

$$\begin{cases} y_{\texttt{pred}}(s'_{\texttt{notWinter}}) = a_{0,\texttt{notWinter}} + a_{1,\texttt{notWinter}} \cdot d(s'_{\texttt{notWinter}}) \\ y_{\texttt{pred}}(s''_{\texttt{notWinter}}) = a_{0,\texttt{notWinter}} + a_{1,\texttt{notWinter}} \cdot d(s''_{\texttt{notWinter}}) \end{cases}$$

Solving it leads us to

$$a_{1,g} = \frac{y_{pred}(s'_g) - y_{pred}(s''_g)}{d(s'_g) - d(s''_g)} \qquad a_0 = y_{pred}(s'_g) - a_1 \cdot d(s'_g)$$

```
## [generalized least squares trend estimation]
```

```
## [generalized least squares trend estimation]
```

```
##            a0            a1
## 220.733450895  -0.009433135
```

```
## [generalized least squares trend estimation]
```

```
## [generalized least squares trend estimation]
```

```
##           a0           a1
## 447.15365144  -0.06925818
```

1.3 Point C

Model 2

1.4 Point D

```
## [generalized least squares trend estimation]
```

```
## [1] 429.9578
```