Contents

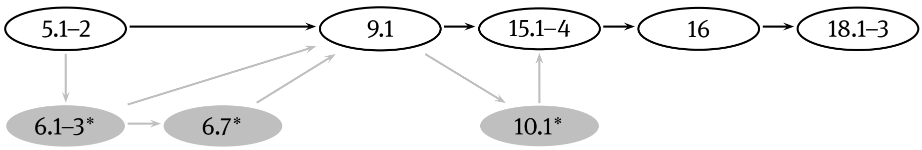
Dependence chart

As we have already mentioned in the preface, there are at least three paths through this book which highlight different aspects of Brownian motion: Brownian motion and Itô calculus, Brownian motion as a Markov process, and Brownian motion and its sample paths. Below we suggest some fast tracks “C”, “M” and “S” for each route, and we indicate how the other topics covered in this book depend on these fast tracks. This should help you to find your own personal sample path. Starred sections (in the grey ovals) contain results which can be used without proof and without compromising too much on rigour.

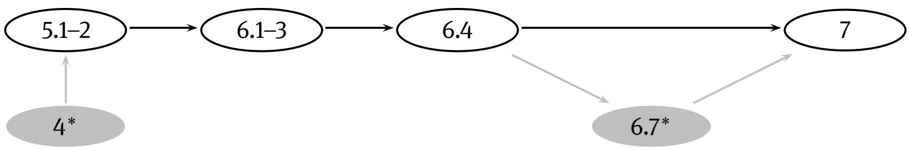
Getting started

For all three fast tracks you need to read Chapters 1 and 2 first. If you are not too much in a hurry, you should choose *one* construction of Brownian motion from Chapter 3. For the beginner we recommend either Sections 3.1, 3.2 or Section 3.4.

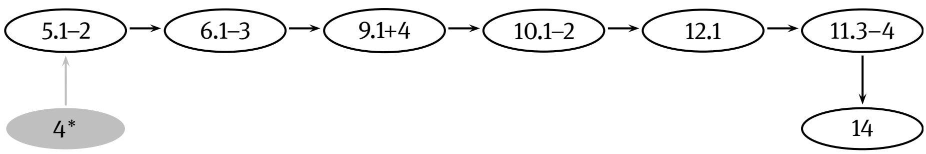
Basic stochastic calculus (C)



Basic Markov processes (M)



Basic sample path properties (S)



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Dependence to the sections 5.1–23.2

The following list shows which prerequisites are needed for each section. A star as in 4* or 6.7* indicates that some result(s) from Chapter 4 or Section 6.7 are used which may be used without proof and without compromising too much on rigour. Starred sections are mentioned only where they are actually needed, while other prerequisites are repeated to indicate the full line of dependence. For example,

6.6: M *or* S *or* C, 6.1–3 indicates that the prerequisites for Section 6.6 are covered by either “M” or “S” or “C if you add 6.1, 6.2, 6.3”. Since we do not refer to later sections with higher numbers, you will need only those sections in “M”, “S”, or “C and 6.1, 6.2, 6.3” with section numbers below 6.6.

19.1: C, 18.4–5, 17* means that 19.1 requires “C” plus the Sections 18.4 and 18.5. Some results from 17 are used, but they can be quoted without proof.

5.1: C *or* M *or* S
5.2: C *or* M *or* S
5.3: C *or* M *or* S
6.1: M *or* S *or* C
6.2: M *or* S *or* C, 6.1
6.3: M *or* S *or* C, 6.1–2
6.4: M *or* S *or* C, 6.1–3
6.5: M *or* S *or* C, 6.1–3
6.6: M *or* S *or* C, 6.1–3
6.7: M *or* S *or* C, 6.1–3
7.1: M, 4.2* *or* C, 6.1, 4.2*
7.2: M *or* C, 6.1, 7.1
7.3: M *or* C, 6.1, 7.1–2
7.4: M *or* C, 6.1, 7.1–3
7.5: M *or* C, 6.1, 7.1–4
7.6: M *or* C, 6.1, 7.1–5
8.1: M *or* C, 6.1, 7.1–3
8.2: M, 8.1 *or* C, 6.1, 7.1–3, 8.1
8.3: M, 8.1–2 *or* C, 6.1, 7.1–4, 8.1–2
8.4: M, 6.7*, 8.1–3* *or* C, 6.1–4, 7, 6.7*, 8.1–3*
9.1: S *or* C *or* M
9.2: S *or* C *or* M, 9.1
9.3: S *or* C *or* M, 9.1
9.4: S *or* C *or* M, 9.1
10.1: S *or* C *or* M
10.2: S *or* C *or* M
10.3: S *or* C *or* M
11.1: S *or* M *or* C
11.2: S, 11.1, 10.3* *or* M, 11.1, 10.3* *or* C, 11.1, 10.3*
11.3: S *or* M *or* C, 6.1–3
11.4: S *or* M *or* C, 6.1–3
11.5: S, 11.3–4, 11.2* *or* M, 11.3–4, 11.2* *or* C, 6.1–3, 11.3–4, 11.2*
12.1: S, 10.3* *or* C, 10.3* *or* M, 10.3*
12.2: S *or* C, 12.1 *or* M, 12.1
13.1: S
13.2: S, 13.1
13.3: S, 13.1–2, 4*
14: S *or* C *or* M
15.1: C *or* M
15.2: C, 6.7* *or* M, 15.1, 6.7*
15.3: C *or* M, 15.1–2
15.4: C *or* M, 15.1–3, 9.1*
15.5: C, 6.7*
15.6: C, 15.5
16: C *or* M, 15.1–4
17.1: C
17.2: C, 15.5, 17.1*
17.3: C, 17.2, 15.5*, 17.1*
18.1: C
18.2: C
18.3: C
18.4: C
18.5: C, 18.4
18.6: C, 18.4–5
18.7: C
19.1: C, 18.4–5, 17*
19.2: C, 18.4–5
19.3: C, 18.4–5, 19.1
19.4: C, 18.4–5
19.5: C, 15.5, 17, 18.4–5, 19.2
19.6: C, 18.4–5, 19.2
19.7: C, 18.4–5
19.8: C, 18.7, 11.4–5, 19.2*, 19.7*, 10.1*
20: C, 18.4, 18.5
21.1: C
21.2: C, 21.1
21.3: C, 21.1
21.4: C, 21.1–3
21.5: C, 18.4–5, 21.1
21.6: C, 18.4, 18.7, 19.2–3, 21.1–5
21.7: C, 6.1, 18.4–5, 21.1, 21.5
21.8: C, 18.4–5, 21.1, 21.5–6
21.9: C, 18.4–5, 21.1, 21.5–6, 10.1*, 19.7*
22.1: C, 18.6
22.2: C, 18.6, 21.1, 21.5, 22.1
23.1: M *or* C, 6.1, 7
23.2: C, 6.1, 7, 18.4–5, 21, 23.1
23.3: C, 18.4–5, 19.1, 19.3, 21, 23.1–2, 8*
23.4: C, 16, 17, 18.4–5, 21, 23.1–3, 19.2*, 19.4*, 19.5*

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With a Chapter on Simulation by Björn Böttcher

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Book Cover

The cover shows a photograph of the *Quantum Cloud* sculpture by Antony Gormley in London, almost directly on the Greenwich Meridian (51° 30’ 6.48" N and 0° 00’ 32.76" E). It is approximately 30 metres high and portrays a figure appearing in a cloud of tetrahedron-shaped metal pieces; the cloud around the figure was constructed with the help of a random walk algorithm.

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