5. Comparison: Example 1

The difference between the stochastic VTs (median: 19.4 yr; expectation value: 22.0 yr) and the deterministic VT (5.7 yr) in Example 1 is considerable and requires further discussion.

1. The consideration of changes in atmospheric CO_2 at two specific times (here 1980 and 1989) may not be sufficient to correctly grasp their dynamics in between these two times (i.e., for 1980–1989). This is the case here, as can also be inferred from Figure 5. The 1980 and 1989 changes in atmospheric CO_2 suggest a decreasing trend of -0.039 GtC yr^{-1}/yr (expressed in GtC yr^{-1}/yr instead of ppmv yr^{-1}/yr; see Worksheet A.4: Section 3), while a linear regression for 1980–1989 results in an increasing trend of +0.039 GtC yr^{-1}/yr (Jonas *et al.*, 1999: Section 4.1).[1] This raises the issue of appropriately selecting representative time intervals for the calculation of VTs.

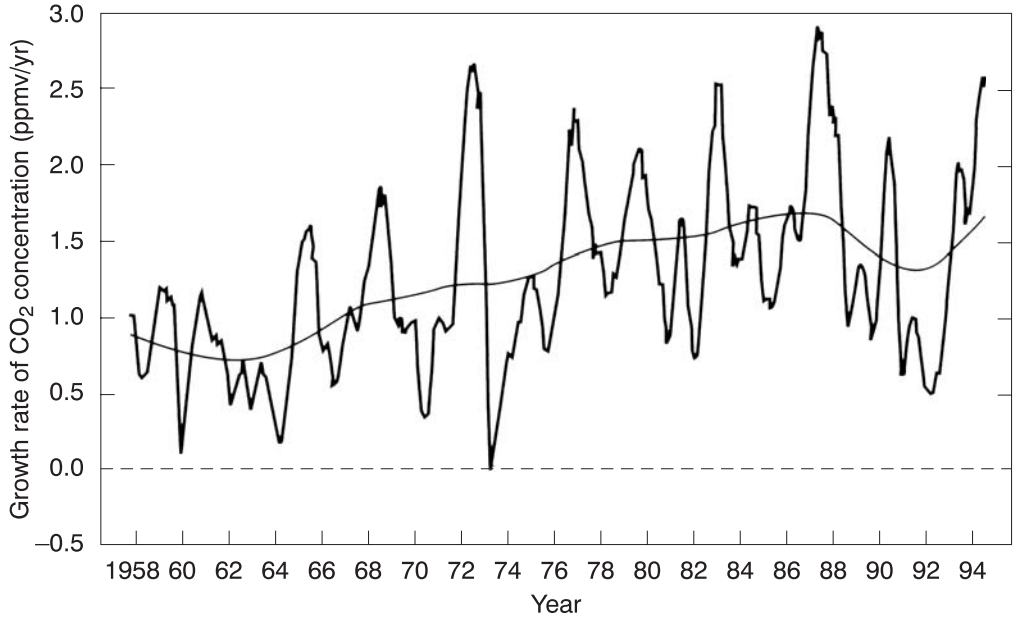

Figure 5: Growth rate of CO_2 concentrations since 1958 in ppmv yr^{-1} at the Mouna Loa, Hawaii station. Of importance in the context here are the high growth rates of the late 1980s, the low growth rates of the early 1990s, and the following upturn in the growth rate. The smoothed curve shows the same data but filtered to suppress variations on time scales less than approximately 10 years. Source: Schimel *et al.* (1996: Figure 2.2).[2]

[1] Note that here a ppmv yr^{-1}-to-GtC yr^{-1} conversion factor of 2.123 GtC/ppmv is used (see Annex Worksheet A.1), while Jonas *et al.* (1999) use a conversion factor of 2.092 GtC/ppmv.

[2] Schimel, D., D. Alves, I. Enting, M. Heimann and co-authors and contributors (1996). Radiative forcing, of climate change. In: *Climate Change 1995. The Science of Climate Change.* J.T. Houghton, L.G. Meira Filho, B.A. Callander, N. Harris, A. Kattenberg and K. Maskell (eds.), Cambridge University Press, Cambridge, United Kingdom, 65–131.

2. The two-points-in-time (1980 and 1989) trend (-0.039 GtC yr^{-1}/yr) as well as the decade (1980–1989) trend of changes in atmospheric CO_2 (+0.039 GtC yr^{-1}/yr) are small. For comparison, the 1980–1989 trend of emissions from fossil fuel burning, cement manufacture and gas flaring (0.146 GtC yr^{-1}/yr; Jonas *et al.*, 1999: Section 4.3) is greater by almost a factor of four. Inequality (2.3) tells us that a great amount of uncertainty in the net emissions (numerator) and/or – of relevance here – a relatively small rate of net emission change (denominator) may cause the VT to become very great. Therefore, a small deviation from the given rate of net emission change may entail a considerable deviation from the (deterministic) VT.