

9.5 Random Walks

Random Walk

- A **random walk** refers to the apparently random motion of an entity.
- This is often the best model of a physical process (Brownian motion) or financial index (stock price), etc.

Aside: Fooled By Randomness

HAMLET: Do you see yonder cloud that's almost in the shape of a camel?

POLONIUS: By the mass, and 'tis like a camel, indeed.

HAMLET: Methinks it is like a weasel.

POLONIUS: It is backed like a weasel.

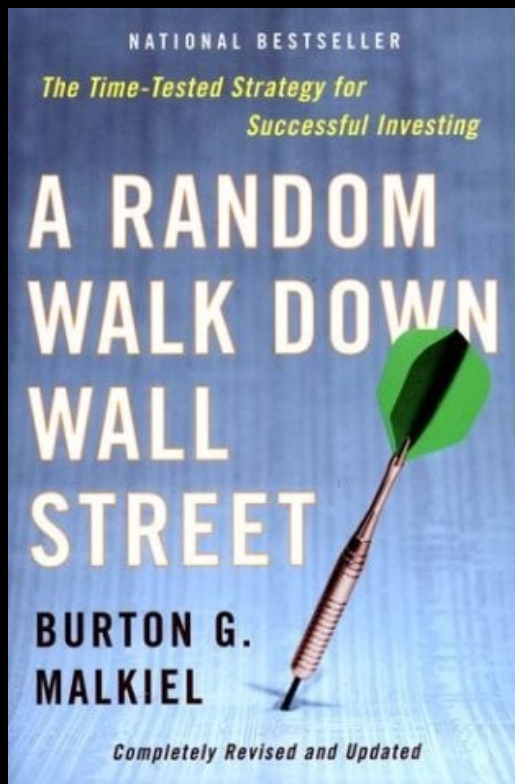
HAMLET: Or like a whale.

POLONIUS: Very like a whale.

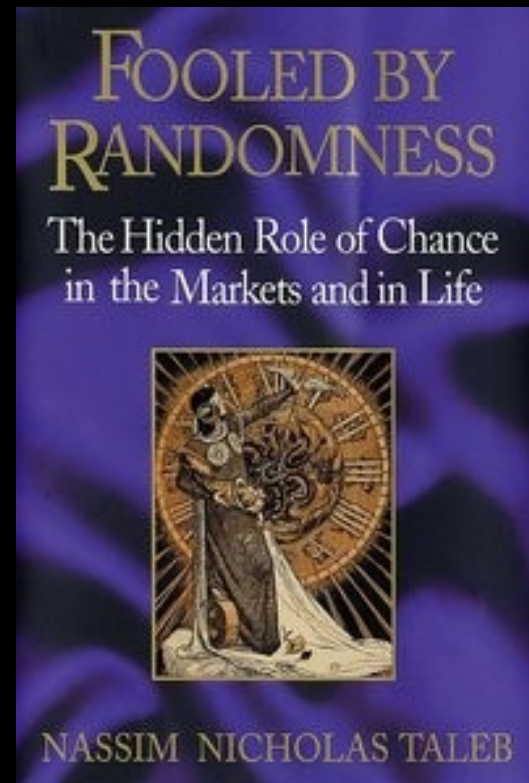
Hamlet Act 2, Scene 2



Aside: Fooled By Randomness

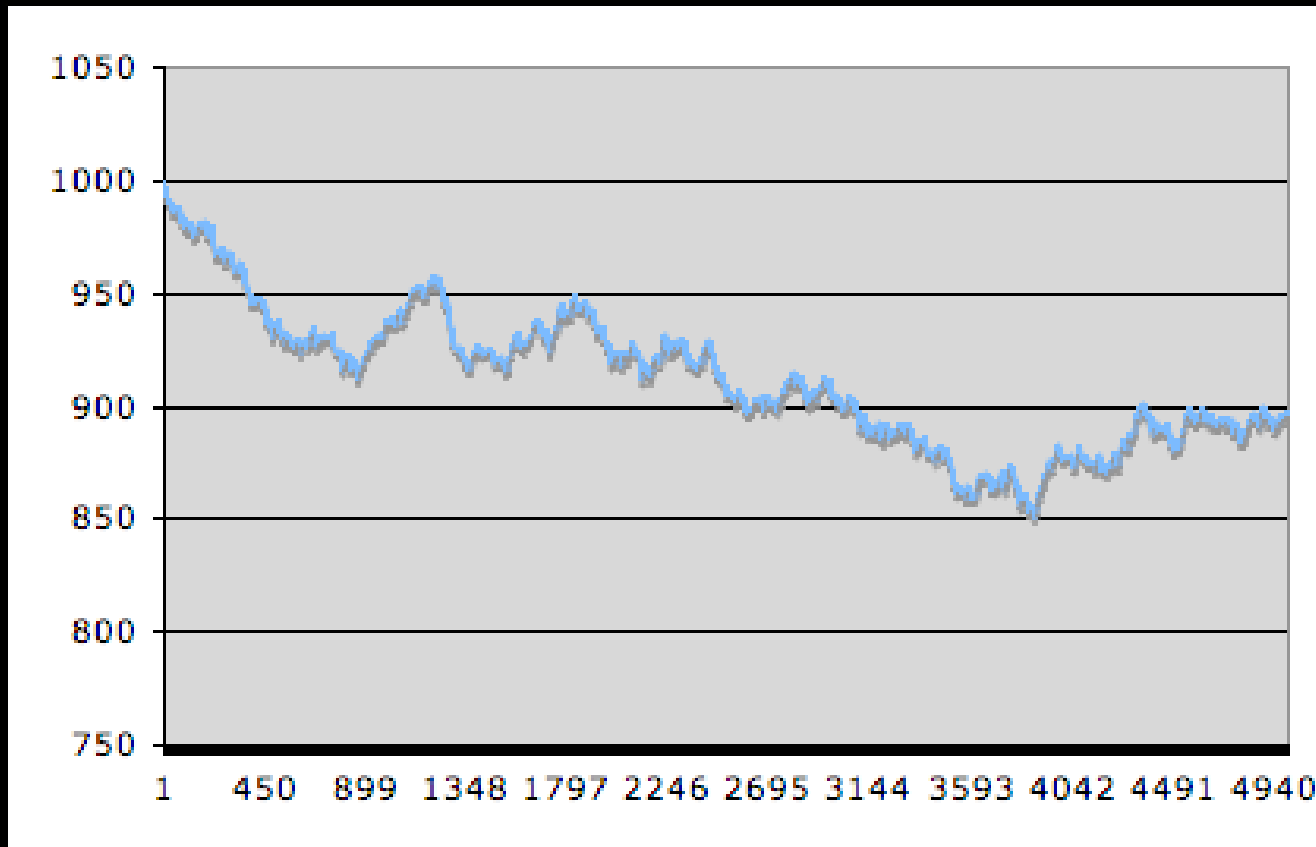


1973



2004

What's the Trend?



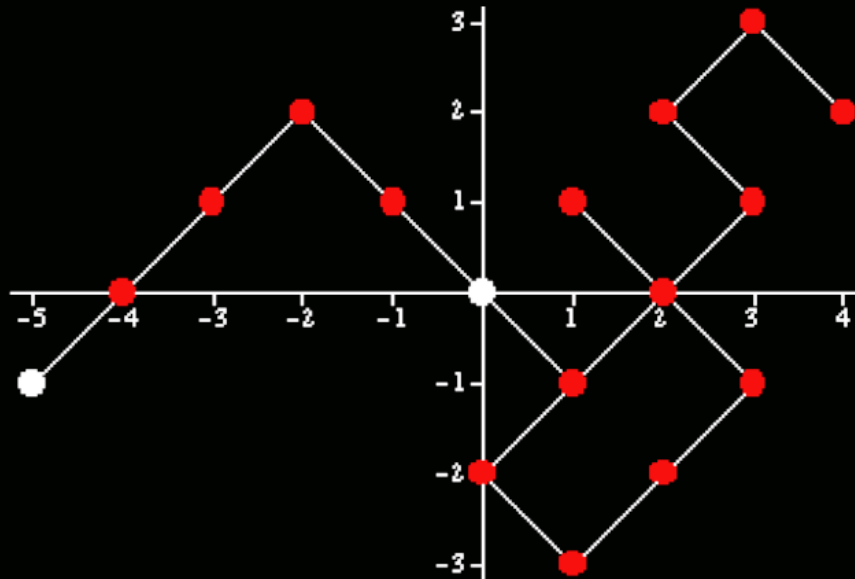
A	B
1000	
=A1+IF(RAND() $>$ 0.5, 1, -1)	

Algorithm for a Random Walk, With Diagonal Steps:

1. seed random number generator
2. let x , x_0 , y , and y_0 be 0
3. let n be the number of steps
4. let list be a list containing the origin
5. do the following n times:
 6. let rand be a random 0 or 1
 7. if rand is 0
 8. increment x by 1
 9. else
 10. decrement x by 1
 11. do the same for y
 12. append point (x, y) onto list
13. create and display graphics of walk
14. report distance between first and last points

Animation

Tricky in Excel, but fortunately a download is available [here](#).



Average Distance Traveled

Average distance traveled increases (but not **monotonically**) with time (# of steps n):

