

Quality Control

What are we worried about?

Dimensions

Finish

Strength

Why?

Assembly

Sliding Surfaces

Parts breaking

Look and feel

Measurement

How much?

Standards

ISO 9000 series

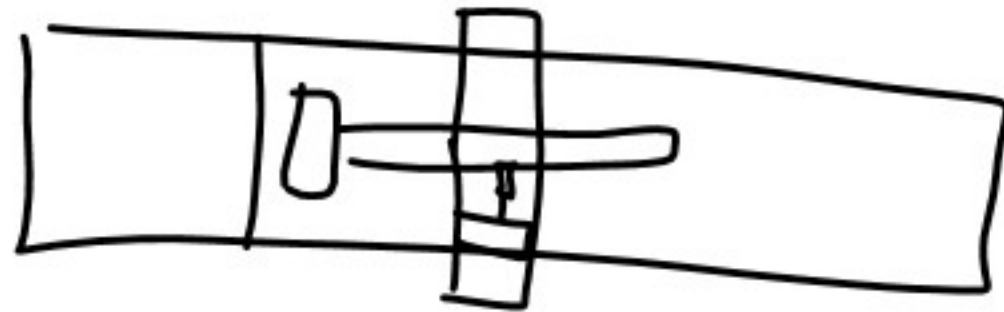
International
Standards
Organization

Statistics

Certifications for
Quality Systems

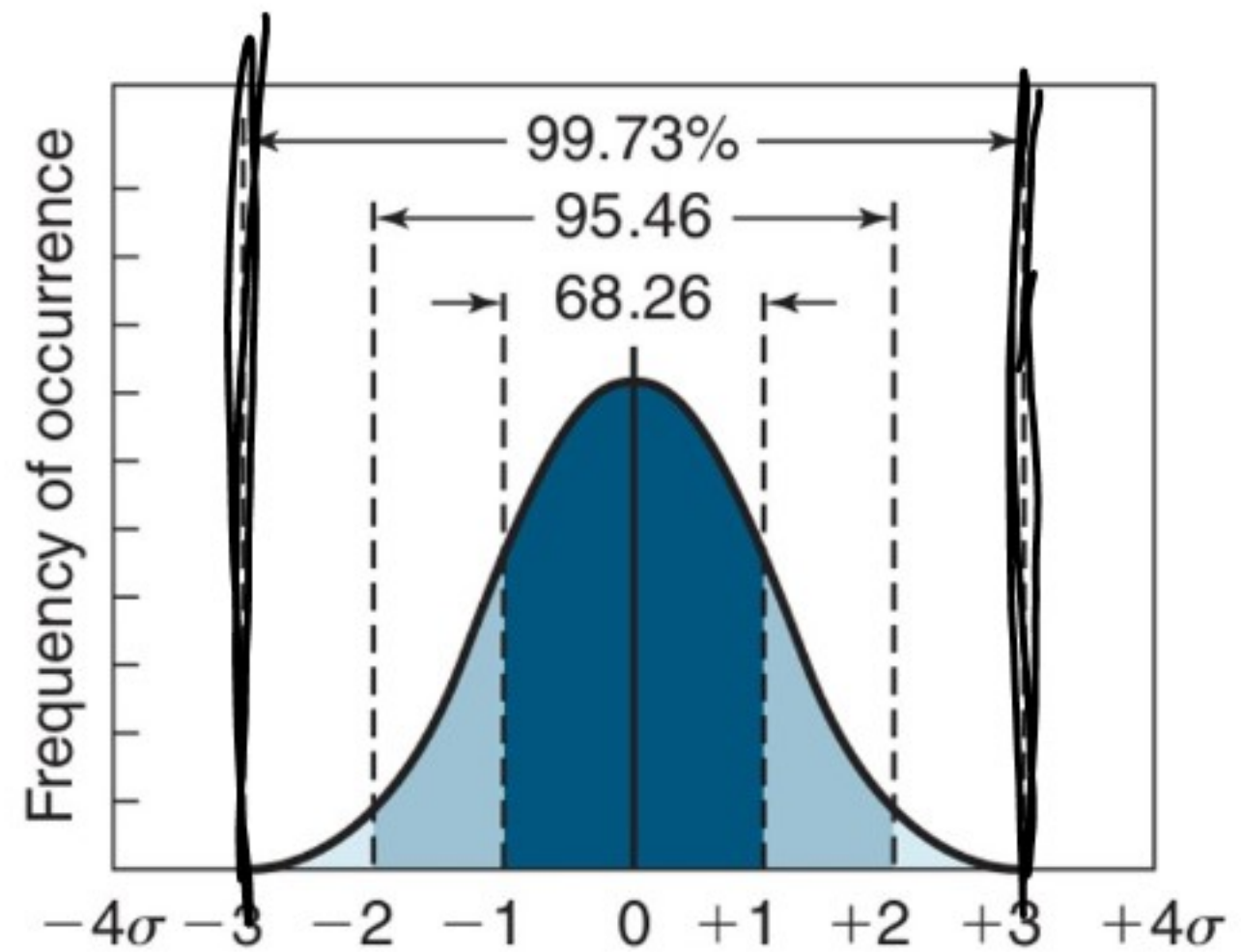
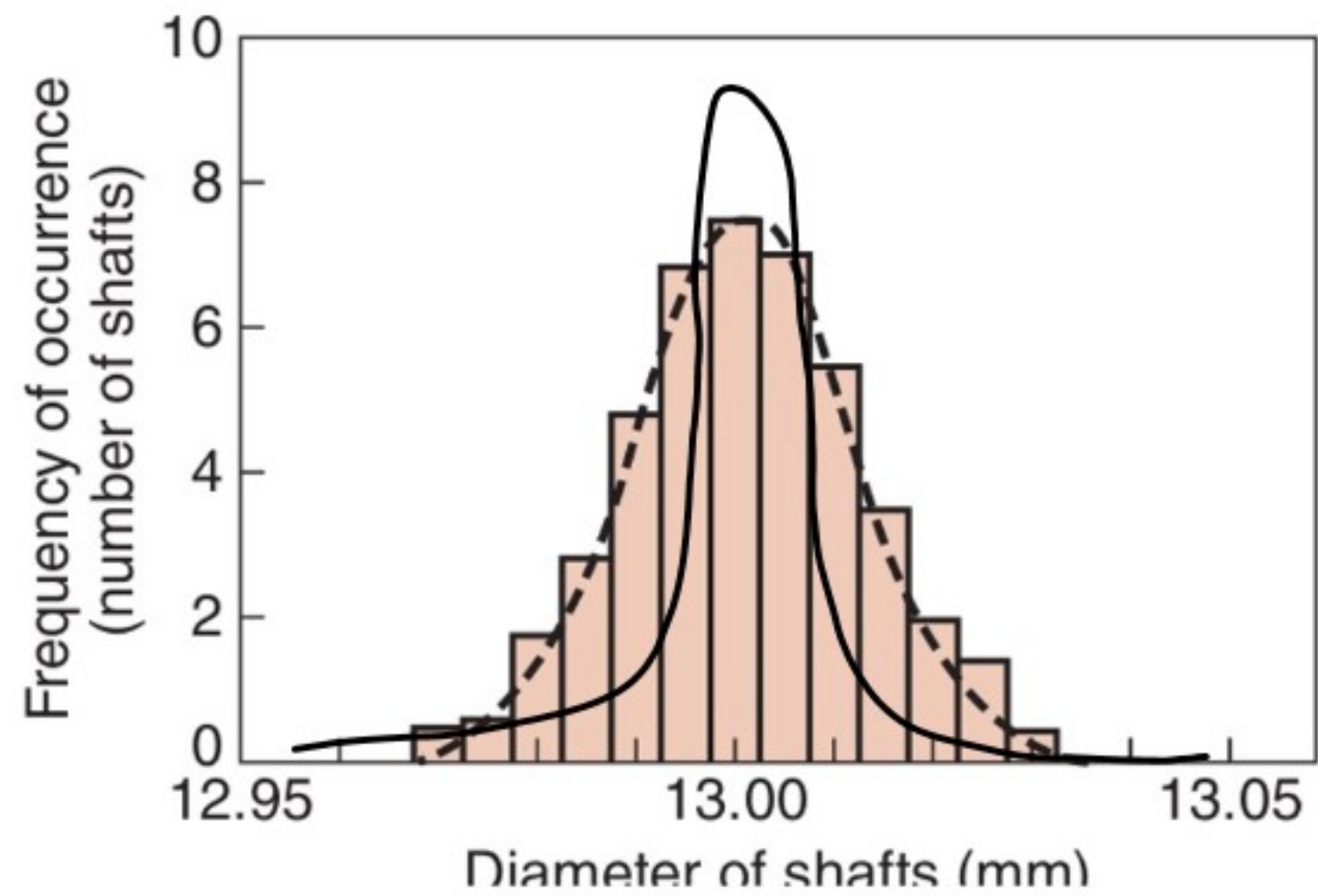
Why Statistics

- human error
- machine error
- temperature
- tool wear
- machine wear
- material properties
- Cutting fluid changes



measure some number of parts (n)

plot the measurements



Example

measure 100 parts $n=100$

all within tolerance

find standard deviation

tolerance band is $\pm 3\sigma$

99.73% of parts in tolerance

0.27% out of tolerance

1 in 370 parts out of tolerance

$\pm 4\sigma$

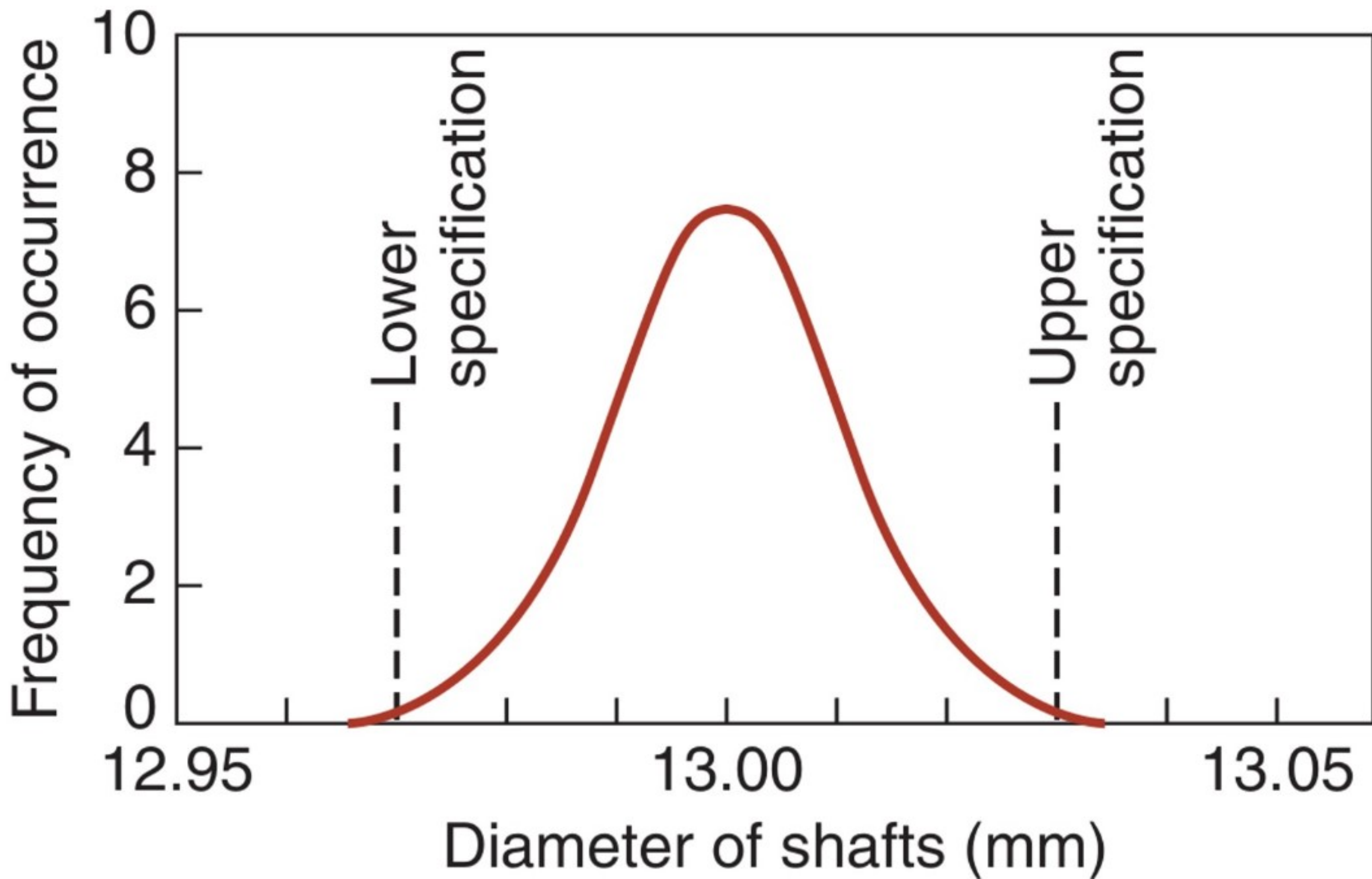
1 in 16000

$\pm 5\sigma$

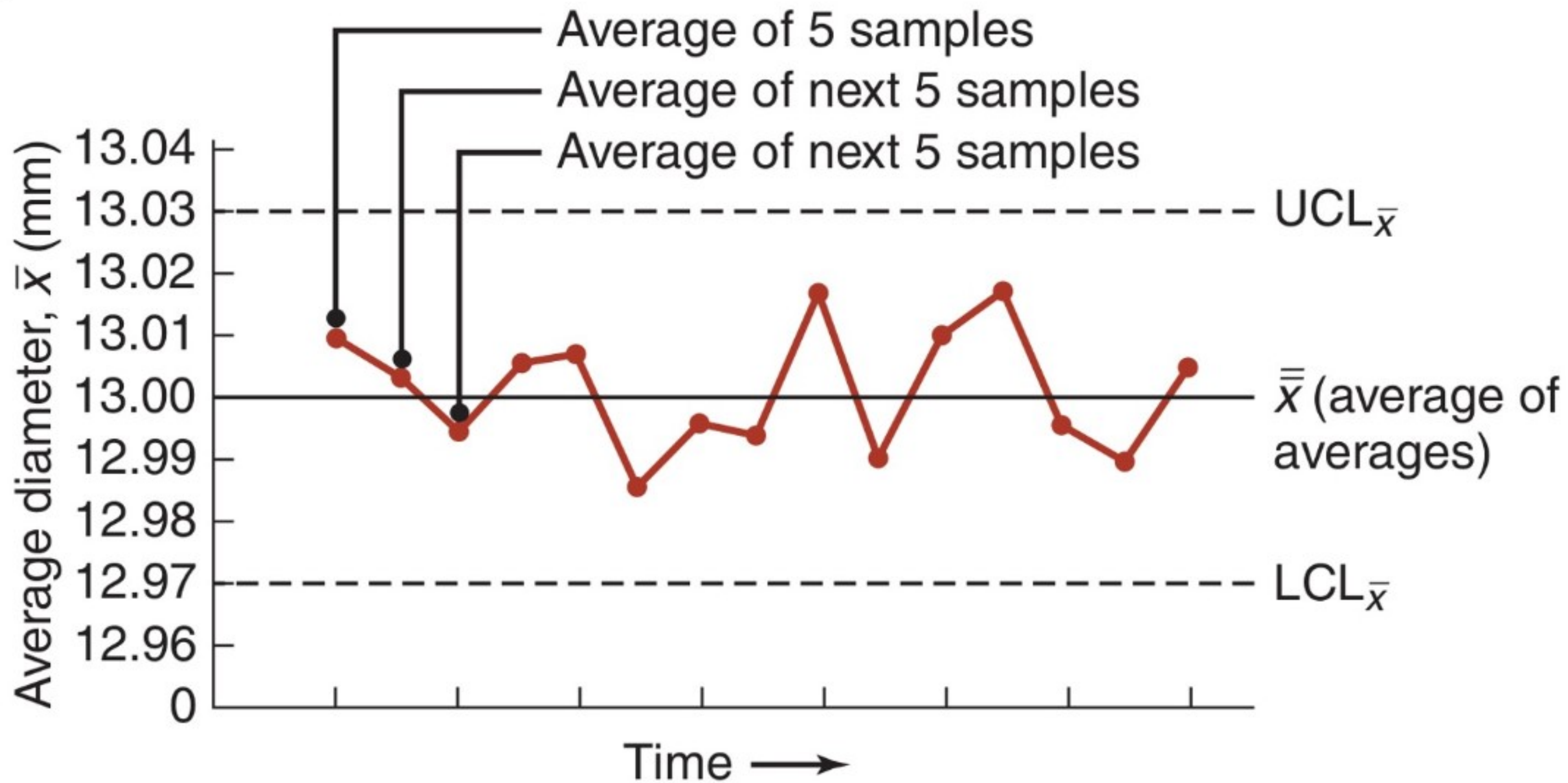
1 in 1.7 million

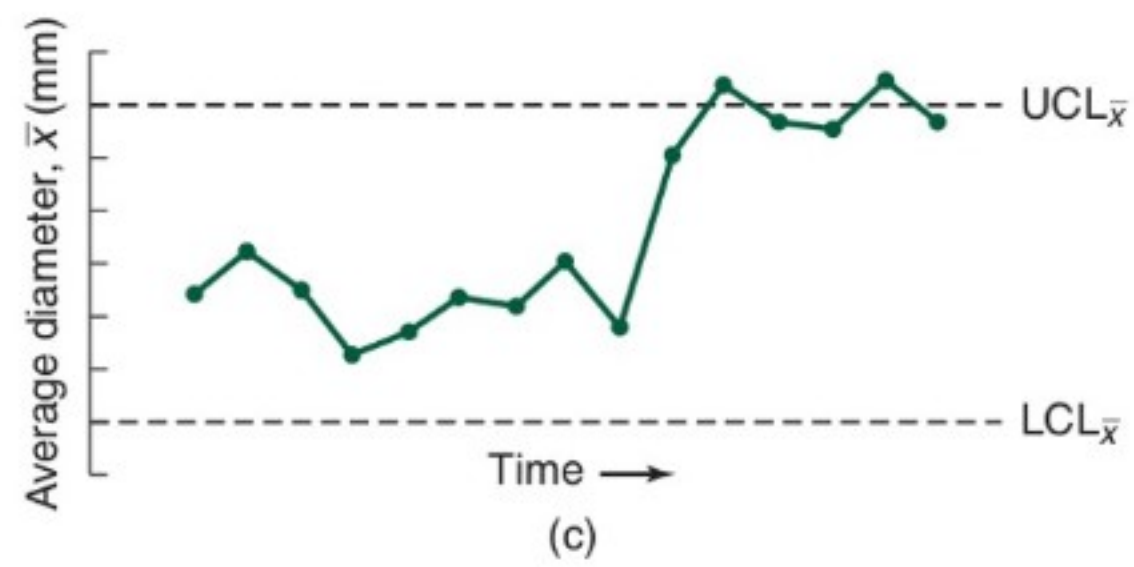
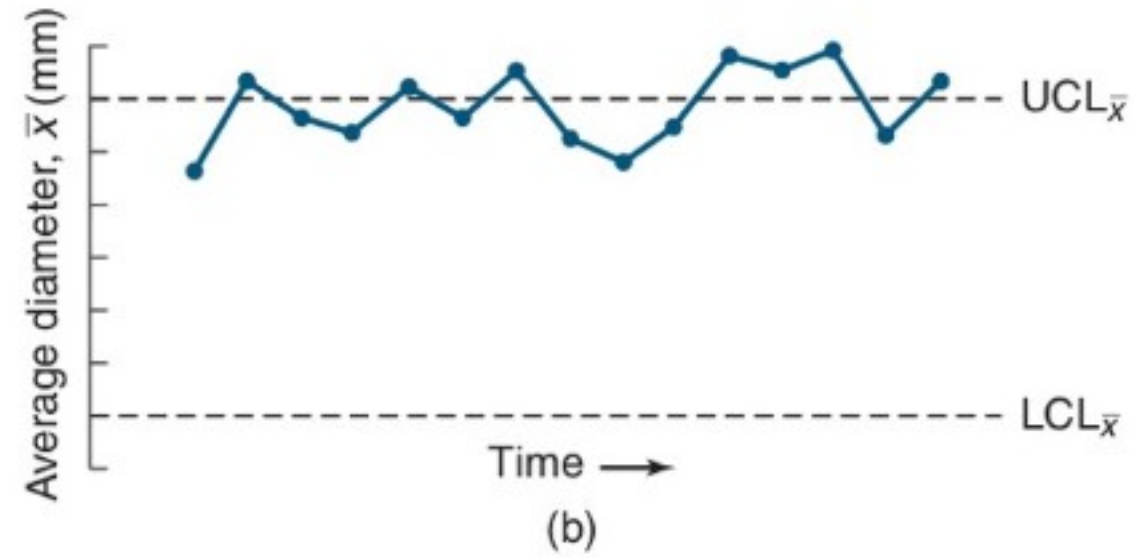
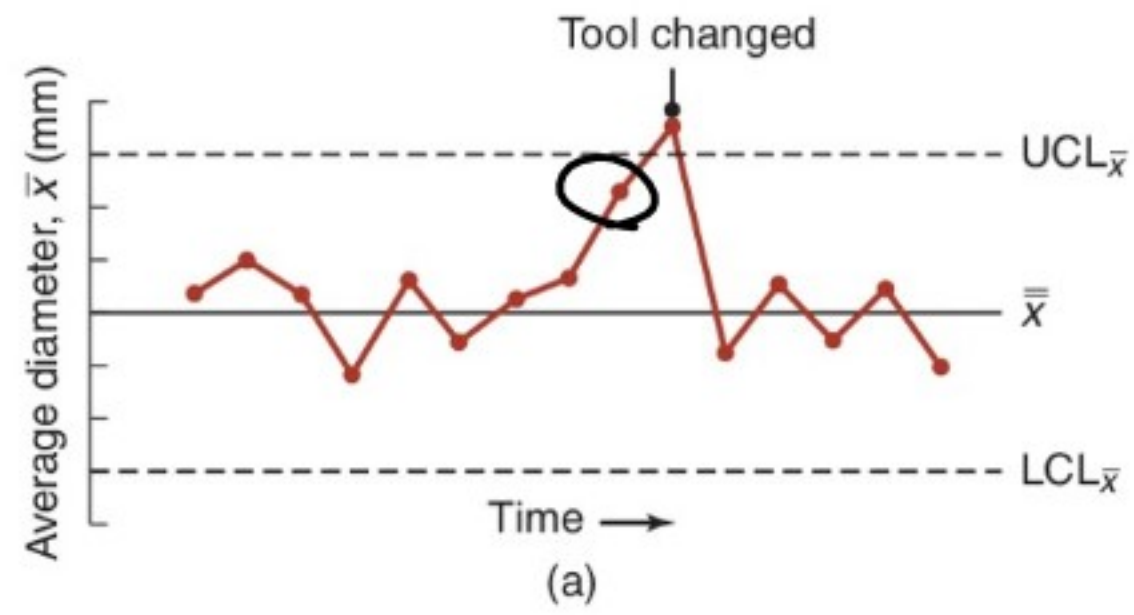
$\pm 6\sigma$

1 in 26 million

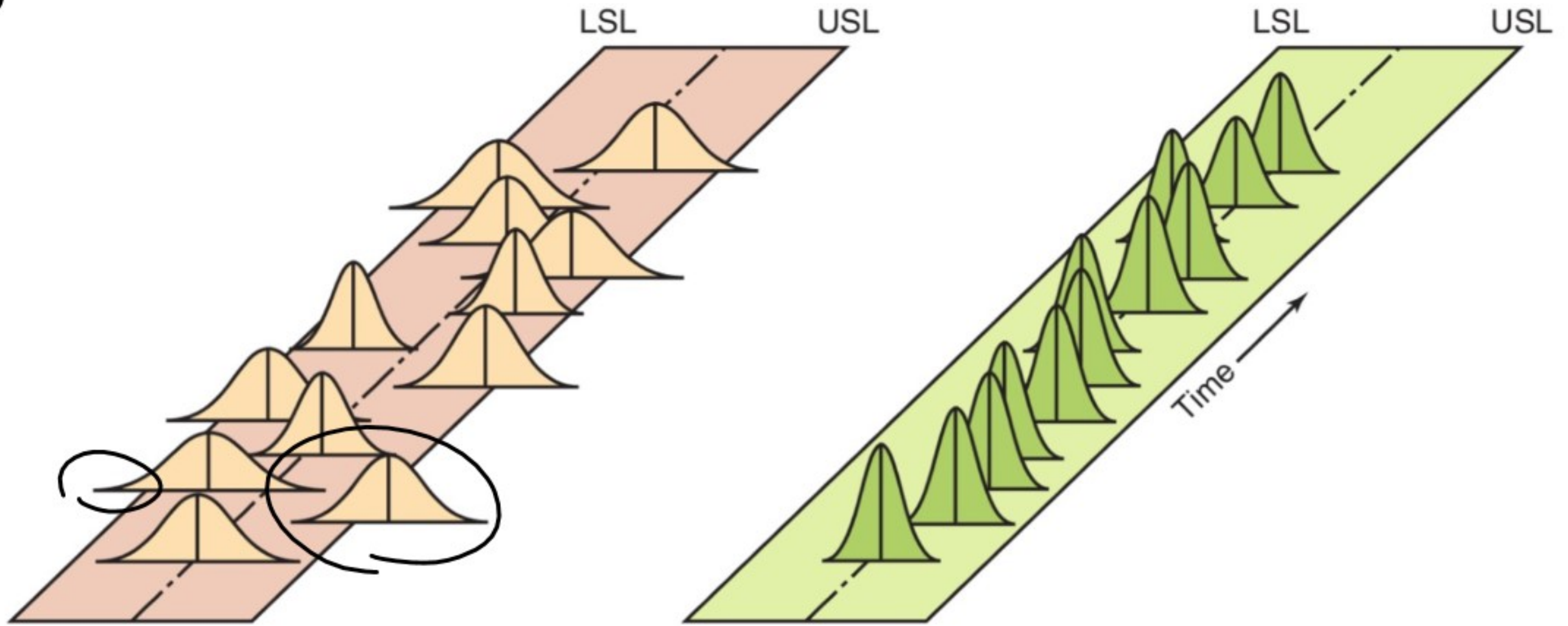


Control Charts





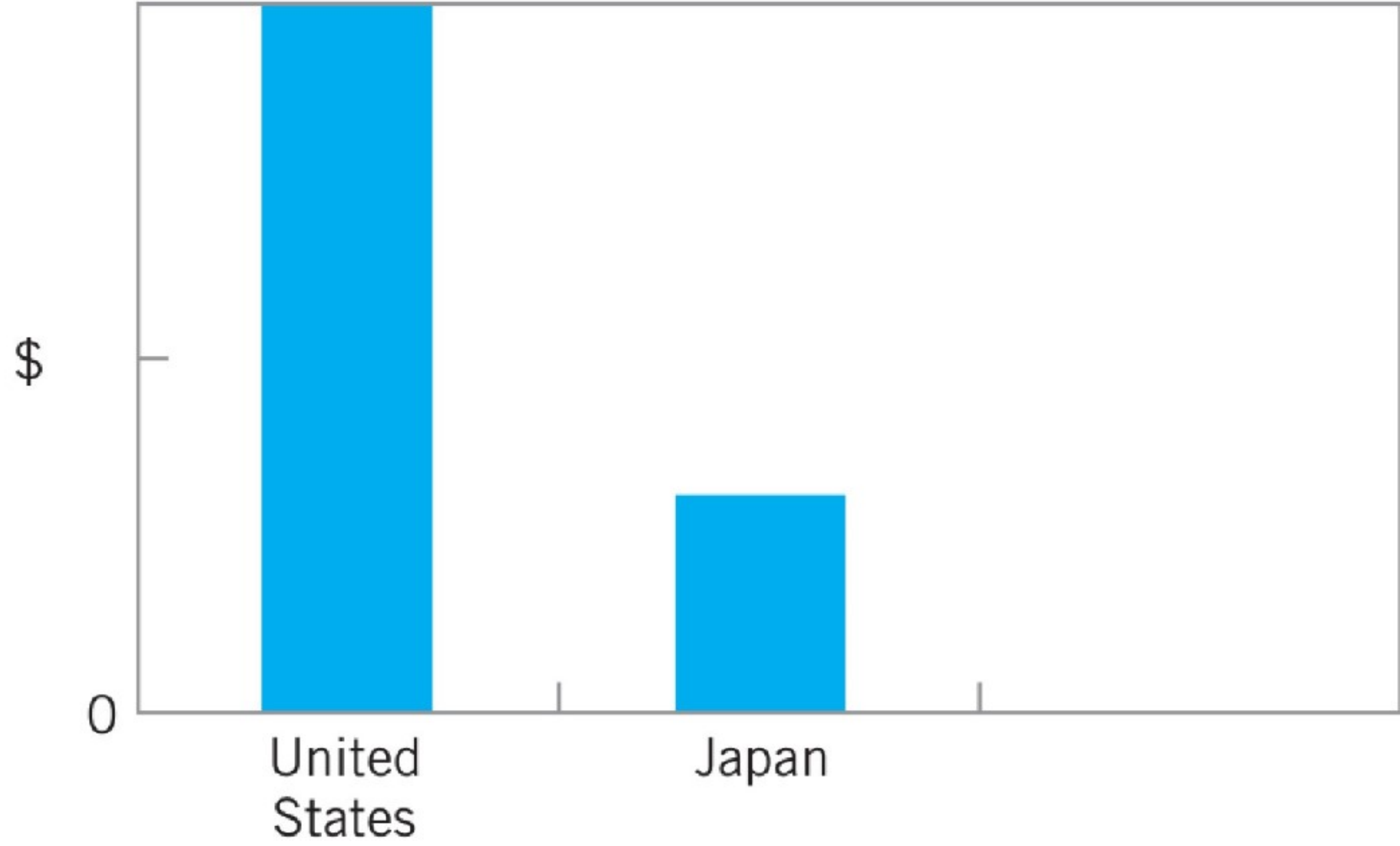
Stable and unstable processes

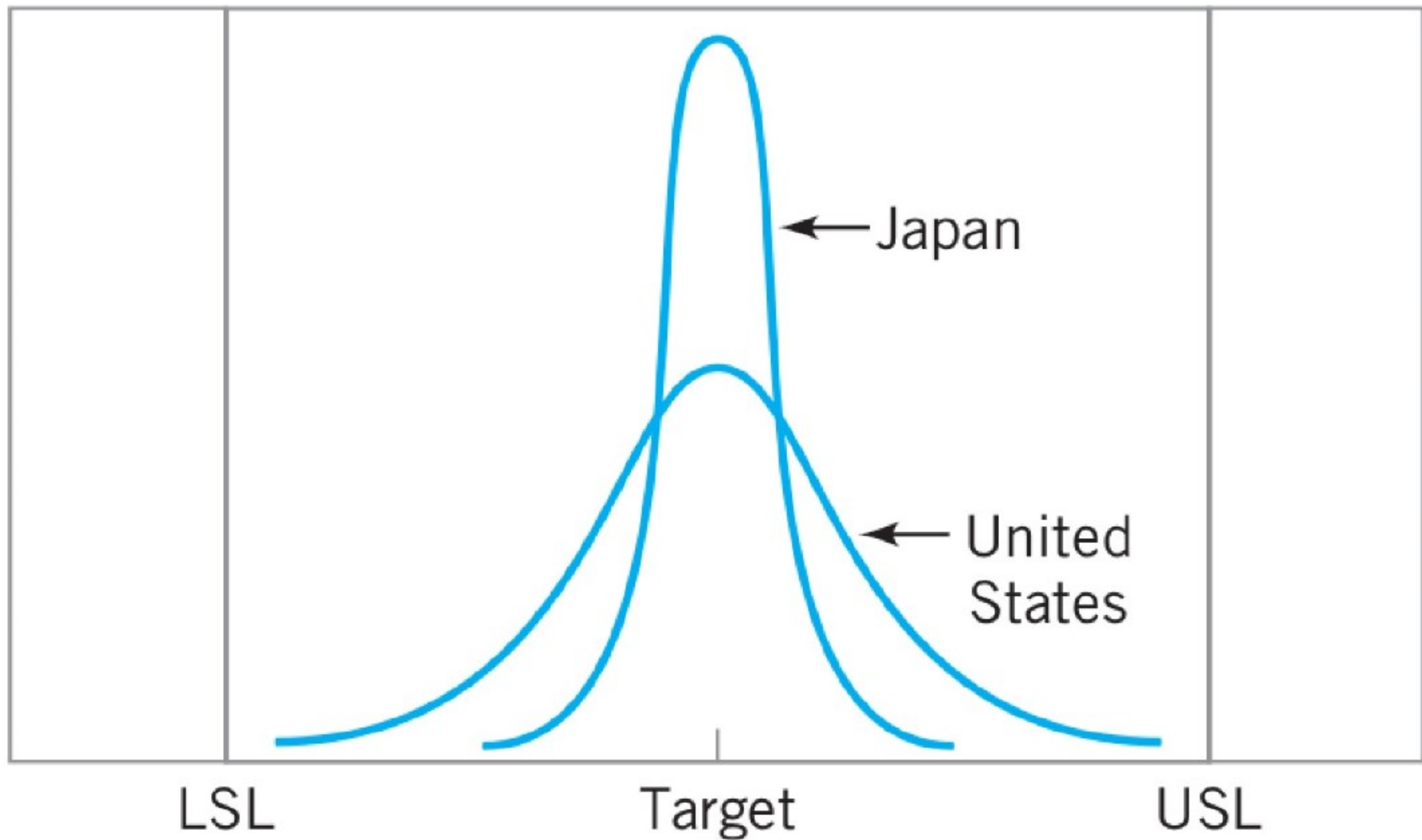


(a) Unstable

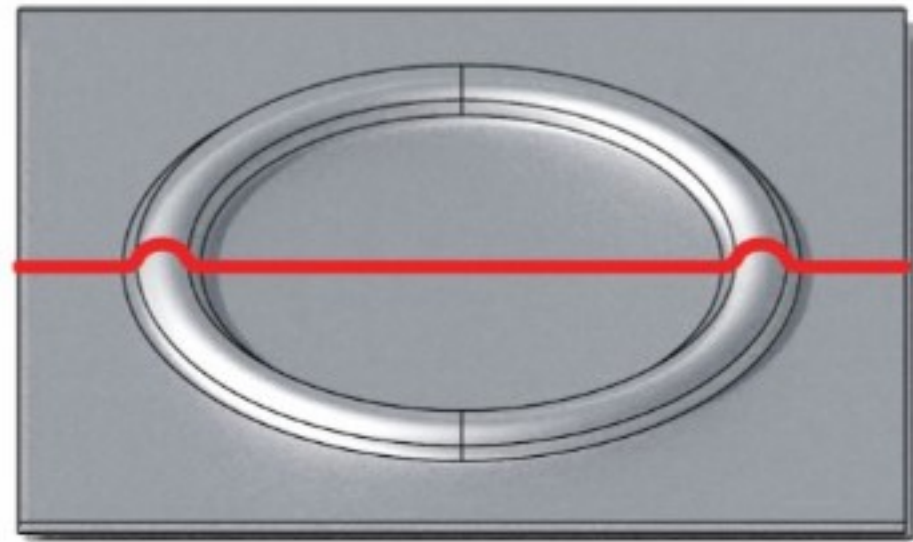
(b) Stable

Transmission warranty costs

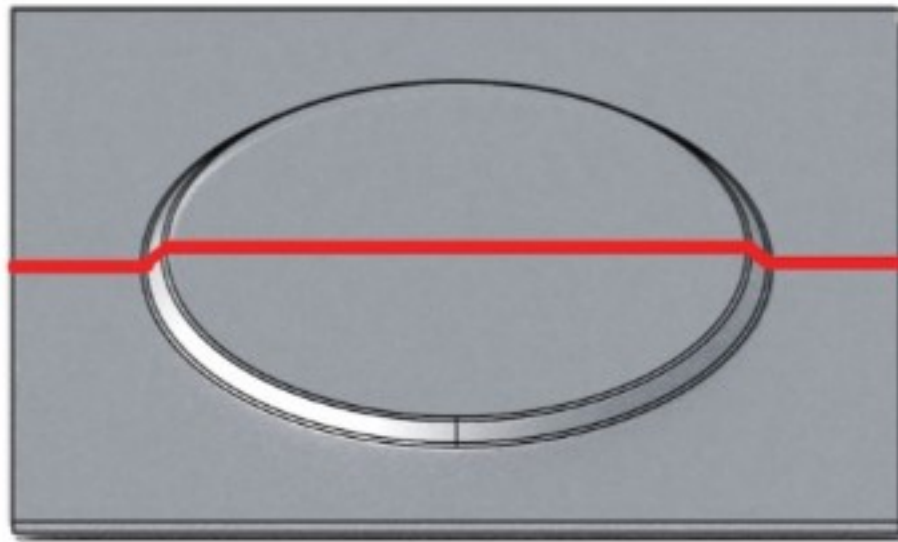




- ▶ Gear Cutting
(<https://www.tiktok.com/@romisamilkate86/video/7163927429109550382>)
- ▶ Gear Hardening
(<https://www.tiktok.com/@extremetals/video/7160766023254314286>)
- ▶ Rotary Forging
(<https://www.tiktok.com/@pangbang666/video/7159197613500173574>)
- ▶ Forging (<https://www.tiktok.com/@blancheteng/video/7163261669534092590>)
- ▶ Beadrolling (<https://www.tiktok.com/@gmssfap/video/7163106182784175402>)



Bead Rolling



Offset Wheel



Flare Rolling

