

Public PROBABILITY(0,0) As Number ; [number of trials][number of ups] Pr(success) = PROB\_UP.

Public MAX\_TRIALS As Number

Private p As Number

Private q As Number

Private NumTrials As Number

Private NumTrialsPlusOne As Number

Private NumSuccesses As Number

Private Mode As Number

Private LeftIdx As Number

Private RightIdx As Number

Private Total As Number

Private Initialized As Number

If Initialized = 0 Then

  If MOD\_POINT\_NO > 1 Then

    ERROR("!!! \*\*\* Error! It appears that Parallel Model Point Processing is enabled. Please disable. \*\*\* !!!")

  EndIf

  MAX\_TRIALS := ROUND\_UP((RETIREMENT\_AGE\_YEARS + 1) \* PERIODS\_PER\_YEAR, 0)

  ARRAY\_INITIALISE(PROBABILITY, MAX\_TRIALS + 1, MAX\_TRIALS + 1)

  p := PROB\_DOWN

  q := PROB\_UP

  ; Save the heavy machinery for harder problems.

  PROBABILITY(0, 0) := 1

  PROBABILITY(1, 0) := q

  PROBABILITY(1, 1) := p

For NumTrials := 2 To MAX\_TRIALS

  NumTrialsPlusOne := NumTrials + 1

  ; Handle limit cases first. Note that Probability array was zeroed above.

  If p = 0 Then

    PROBABILITY(NumTrials, 0) := 1

  ElseIf p = 1 Then

    PROBABILITY(NumTrials, NumTrials) := 1

  Else

    Mode := ROUND\_DOWN((NumTrialsPlusOne) \* p, 0)

  ; Start big. It's all downhill from here.

  PROBABILITY(NumTrials, Mode) := 1.79e308 / NumTrialsPlusOne

  ; Calculate unscaled probabilities going up.

  NumSuccesses := Mode + 1

  Do While NumSuccesses < NumTrialsPlusOne

    PROBABILITY(NumTrials, NumSuccesses) := PROBABILITY(NumTrials, NumSuccesses - 1) \* \_  
      (p \* (NumTrials - NumSuccesses + 1) ) / (q \* NumSuccesses)

    NumSuccesses := NumSuccesses + 1

  Loop

; Calculate unscaled probabilities going down.

NumSuccesses := Mode - 1

Do While NumSuccesses > -1

PROBABILITY(NumTrials, NumSuccesses) := PROBABILITY(NumTrials, NumSuccesses + 1) \* \_  
(q \* (NumSuccesses + 1) ) / (p \* (NumTrials - NumSuccesses))

NumSuccesses := NumSuccesses - 1

Loop

; Add them up, smallest to tallest.

Total := 0

LeftIdx := 0

RightIdx := NumTrials

Do While LeftIdx <= RightIdx

If PROBABILITY(NumTrials, LeftIdx) < PROBABILITY(NumTrials, RightIdx) Then

Total := Total + PROBABILITY(NumTrials, LeftIdx)

LeftIdx := LeftIdx + 1

Else

Total := Total + PROBABILITY(NumTrials, RightIdx)

RightIdx := RightIdx - 1

EndIf

Loop

; Normalize the probabilities.

For NumSuccesses := 0 To NumTrials

PROBABILITY(NumTrials, NumSuccesses) := PROBABILITY(NumTrials, NumSuccesses) / Total

Next

EndIf

Next ; Num Trials

; That's all folks!

Initialized := 1

EndIf