

ผนวก ง

โปรแกรมที่ใช้ในการวิจัย

ในการวิจัยนี้จะใช้โปรแกรมสำเร็จรูป Minitab for Window 14 ในการจำลองข้อมูลและคำนวณค่าสถิติทดสอบ ซึ่งจะแบ่งเป็น 2 ส่วน คือ

- การหาความน่าจะเป็นของความผิดพลาดประเภทที่ 1
- การหาค่าลิ่งการทดสอบ

1. โปรแกรมที่ใช้ในการหาความน่าจะเป็นของความผิดพลาดประเภทที่ 1

ขนาดตัวอย่าง $n=10$

```
LET k2 = 10                                # Sample size (n)
# File Coefficient for the W-test
LET k4 = "D:\Random\Coefficients_for_Wa10.txt"
RANDOM k2 c1;
Normal 0 1.
NAME k2 'n'.
NAME c1 'Random'.
NAME c2 'Xi'.
NAME c3 'i'.
NAME c4 'X(i)'.
NAME c5 'F(x)'.
SORT c1 c2.
RANK 'Xi' c3.
LET k11 = MEAN('Xi')                       # Estimate Mean for Standardized
LET k12 = STDEV('Xi')                      # Estimate Variance for Standardized
LET c4 = ((c2-k11)/k12)
```

SORT c4 c4

CDF c4 c5;

NORMAL 0 1.

Za

LET c6 = (log('F(x)')) / ('N' - 'i' + 0.5)

LET c7 = (log(1 - 'F(x)')) / ('i' - 0.5)

LET c8 = (c6 + c7)

LET k13 = (- (Sum(c8)))

LET k14 = ((10 * k13) - 32)

NAME k13 'Za'

NAME k14 '10Za-32'

Zc

NAME k15 'Zc'

LET c9 = (1 / 'F(x')) - 1

LET c10 = (('N' - 0.5) / ('i' - 0.75)) - 1

LET c11 = log(c9 / c10)

LET k15 = ssq(c11)

Zk

NAME k16 'Zk'

LET c12 = ('i' - 0.5) * (log(('i' - 0.5) / ('N' * 'F(x)')))

LET c13 = ('N' - 'i' + 0.5) * (log(('N' - 'i' + 0.5) / ('N' * (1 - 'F(x)'))))

LET c14 = c12 + c13

LET k16 = Maximum(c14)

```
##### A #####
```

```
NAME c15 'F(xj)'
```

```
NAME c16 'log_A'
```

```
NAME k17 'A'
```

```
SORT 'F(x)' c15;
```

```
    DESCENDING 'F(x)';
```

```
LET c16 = (2 * 'i' - 1) * (loge('F(x)') + loge(1 - 'F(xj)'))
```

```
LET k17 = ( - 'N' - ( (1/'N')*(sum(c16))) )
```

```
##### Wilk - W #####
```

```
LET c19 = 'X(i)' - Mean('X(i)')
```

```
NAME c19 'Xi-Xbar'
```

```
NAME c21 'X(j)'
```

```
NAME k21 'Wilk'
```

```
WOPEN k4;
```

```
    MERGE;
```

```
    VARIABLE 1;
```

```
    COLUMN 20.
```

```
SORT 'X(i)' 'X(j)';
```

```
    DESCENDING 'X(i)';
```

```
LET c22 = c20 * ('X(j)' - 'X(i)')
```

```
LET k20 = (sum(c22))**2
```

```
LET k21 = k20/(ssq('Xi-Xbar'))
```

```
#####:#####
```

```
PRINT '10Za-32' 'Zc' 'Zk' 'A' 'Wilk'
```

```
#####
```

ขนาดตัวอย่าง n=50

```

LET k2 = 50                                # Sample size (n)
    # File Expected value of normal order stat(mi)
LET k3 = "D:\Random\Expected_Normal_Order\m50.txt"
    # File Coefficient for the W-test
LET k4 = "D:\Random\Coefficients_for_Wa50.txt"
RANDOM k2 c1;
    Normal 0 1.0.
NAME k2 'n'.
NAME c1 'Random'.
NAME c2 'Xi'.
NAME c3 'i'.
NAME c4 'X(i)'.
NAME c5 'F(x)'.
SORT c1 c2.
RANK c2 c3.
LET k11 = MEAN('Xi')                      # Estimate Mean for Standardized
LET k12 = STDEV('Xi')                     # Estimate Variance for Standardized
LET c4 = ((c2-k11)/k12)
SORT c4 c4.
CDF c4 c5;
    NORMAL 0 1.

##### Za #####
LET c6 = (loge ('F(x))) / ('N' - 'i' + 0.5)
LET c7 = (loge(1- 'F(x) )) / ( 'i' -0.5)
LET c8 = (c6+c7)
LET k13 = (- (Sum(c8)))

```

LET k14 = ((10*k13)-32)

NAME k13 'Za'

NAME k14 '10Za-32'

Zc

NAME k15 'Zc'

LET c9 = (1/'F(x')) - 1

LET c10 = (('N' - 0.5)/('i' - 0.75)) - 1

LET c11 = loge (c9/c10)

LET k15 = ssq (c11)

Zk

NAME k16 'Zk'

LET c12 = ('i' - 0.5) * (loge(('i' - 0.5)/('N' * 'F(x)')))

LET c13 = ('N' - 'i' + 0.5) * (loge(('N' - 'i' + 0.5) / ('N' * (1 - 'F(x)')))

LET c14 = c12+c13

LET k16 = Maximum(c14)

A

NAME c15 'F(x)'

NAME c16 'log_A'

NAME k17 'A'

SORT 'F(x)' c15;

DESCENDING 'F(x)'.

LET c16 = (2 * 'i' - 1) * (loge('F(x)') + loge(1 - 'F(x)')))

LET k17 = (- 'N' - ((1/'N')*(sum(c16))))

```
##### Francia - W#####
```

```
WOPEN k3;
```

```
  MERGE;
```

```
  VARIABLE 1;
```

```
  COLUMN 17.
```

```
LET c18 = (c17/SQRT(SSQ(c17))) * 'X(i)'
```

```
LET k18 = (SUM(c18))**2
```

```
LET c19 = 'X(i)' - Mean('X(i)')
```

```
LET k19 = k18/SSQ(c19)
```

```
NAME c19 'Xi-Xbar'
```

```
NAME k19 'Francia'
```

```
##### Wilk - W #####
```

```
NAME c21 'X(j)'
```

```
NAME k21 'Wilk'
```

```
WOPEN k4;
```

```
  MERGE;
```

```
  VARIABLE 1;
```

```
  COLUMN 20.
```

```
SORT 'X(i)' 'X(j)';
```

```
  DESCENDING 'X(i)'.
```

```
LET c22 = c20 * ('X(j)' - 'X(i)')
```

```
LET k20 = (sum(c22))**2
```

```
LET k21 = k20/(ssq('Xi-Xbar'))
```

```
#####
```

```
PRINT '10Za-32' 'Zc' 'Zk' 'A' 'Francia' 'Wilk'
```

```
#####
```

ขนาดตัวอย่าง n=100

```

LET k2 = 100                                # Sample size (n)
      # File Expected value of normal order stat(mi)
LET k3 = "D:\Random\Expected_Normal_Order\m100.txt"
RANDOM k2 c1;
  NORMAL 0 1.0.
NAME k2 'n'.
NAME c1 'Random'.
NAME c2 'Xi'.
NAME c3 'i'.
NAME c4 'X(i)'.
NAME c5 'F(x)'.
SORT c1 c2.
RANK c2 c3.
LET k11 = MEAN('Xi')                       # Estimate Mean for Standardized
LET k12 = STDEV('Xi')                      # Estimate Variance for Standardized
LET c4 = ((c2-k11)/k12)
CDF c4 c5;
  NORMAL 0 1.

##### Za #####
LET c6 = (loge ('F(x'))) / ('N' - 'i' + 0.5)
LET c7 = (loge(1- 'F(x)' )) / ( 'i' -0.5)
LET c8 = (c6+c7)
LET k13 = (- (Sum(c8)))
LET k14 = ((10*k13)-32)
NAME k13 'Za'
NAME k14 '10Za-32'

```

Zc

NAME k15 'Zc'

LET c9 = (1/'F(x')) - 1

LET c10 = (('N' - 0.5)/('i' - 0.75)) - 1

LET c11 = loge (c9/c10)

LET k15 = ssq (c11)

Zk

NAME k16 'Zk'

LET c12 = ('i' - 0.5) * (loge(('i' - 0.5)/('N' * 'F(x)')))

LET c13 = ('N' - 'i' + 0.5) * (loge(('N' - 'i' + 0.5) / ('N' * (1 - 'F(x)'))))

LET c14 = c12+c13

LET k16 = Maximum(c14)

A

NAME k17 'A'

SORT 'F(x)' c15;

DESCENDING 'F(x)'.

LET c16 = (2 * 'i' - 1) * (loge('F(x)') + loge(1- 'F(xj)'))

LET k17 = (- 'N' - ((1/'N')*(sum(c16))))

Francia - W

WOPEN k3;

MERGE;

VARIABLE 1;

COLUMN 17.

LET c18 = (c17/SQRT(SSQ(c17))) * 'X(i)'

LET k18 = (SUM(c18))**2

```
LET c19 = 'X(i)' - Mean('X(i)')
```

```
LET k19 = k18/SSQ(c19)
```

```
NAME c19 'Xi-Xbar'
```

```
NAME k19 'Francia'
```

```
#####
```

```
PRINT '10Za-32' 'Zc' 'Zk' 'A'
```

```
#####
```

2. โปรแกรมที่ใช้ในการหาค่าลัษการทดสอบ

ขนาดตัวอย่าง $n=10$

```

LET k2 = 10                                # Sample size (n)
      # File Coefficient for the W-test
LET k4 = "D:\Random\Coefficients_for_Wa10.txt"
RANDOM k2 c1;
      Beta 1.0 1.0.                          # Random
NAME k2 'n'.
NAME c1 'Random'.
NAME c2 'Xi'.
NAME c3 'i'.
NAME c4 'X(i)'.
NAME c5 'F(x)'.
SORT c1 c2.
RANK 'Xi' c3.
LET k11 = MEAN('Xi')                       # Estimate Mean for Standardized
LET k12 = STDEV('Xi')                      # Estimate Variance for Standardized
LET c4 = ((c2-k11)/k12)
SORT c4 c4.
CDF c4 c5;
      Normal 1.0 1.0.

```

Za

LET c6 = (log('F(x')) / ('N' - 'i' + 0.5))

LET c7 = (log(1 - 'F(x)')) / ('i' - 0.5)

LET c8 = (c6 + c7)

LET k13 = (- (Sum(c8)))

LET k14 = ((10 * k13) - 32)

NAME k13 'Za'

NAME k14 '10Za-32'

Zc

NAME k15 'Zc'

LET c9 = (1 / 'F(x')) - 1

LET c10 = (('N' - 0.5) / ('i' - 0.75)) - 1

LET c11 = log(c9 / c10)

LET k15 = ssq(c11)

Zk

NAME k16 'Zk'

LET c12 = ('i' - 0.5) * (log(('i' - 0.5) / ('N' * 'F(x'))))

LET c13 = ('N' - 'i' + 0.5) * (log(('N' - 'i' + 0.5) / ('N' * (1 - 'F(x')))))

LET c14 = c12 + c13

LET k16 = Maximum(c14)

```
##### A #####
```

```
NAME c15 'F(xj)'
```

```
NAME k17 'A'
```

```
SORT 'F(x)' c15;
```

```
    DESCENDING 'F(x)'.
```

```
LET c16 = (2 * 'i' - 1) * (loge('F(x)') + loge(1 - 'F(xj)'))
```

```
LET k17 = (- 'N' - ((1/'N')*(sum(c16))))
```

```
##### Wilk - W #####
```

```
LET c19 = 'X(i)' - Mean('X(i)')
```

```
NAME c19 'Xi-Xbar'
```

```
NAME c21 'X(j)'
```

```
NAME k21 'Wilk'
```

```
WOPEN k4;
```

```
    MERGE;
```

```
    VARIABLE 1;
```

```
    COLUMN 20.
```

```
SORT 'X(i)' 'X(j)';
```

```
    DESCENDING 'X(i)'.
```

```
LET c22 = c20 * ('X(j)' - 'X(i)')
```

```
LET k20 = (sum(c22))**2
```

```
LET k21 = k20/(ssq('Xi-Xbar'))
```

```
#####
```

```
PRINT '10Za-32' 'Zc' 'Zk' 'A' 'Wilk'
```

```
#####
```

ขนาดตัวอย่าง n=50

```

LET k2 = 50                                # Sample size (n)
    # File Expected value of normal order stat(mi)
LET k3 = "D:\Random\Expected_Normal_Order\m50.txt"
    # File Coefficient for the W-test
LET k4 = "D:\Random\Coefficients_for_Wa50.txt"
RANDOM k2 c1;
    Beta 1.0 1.0.                            # Random
NAME k2 'n'.
NAME c1 'Random'.
NAME c2 'Xi'.
NAME c3 'i'.
NAME c4 'X(i)'.
NAME c5 'F(x)'.
SORT c1 c2.
RANK c2 c3.
LET k11 = MEAN('Xi')                        # Estimate Mean for Standardized
LET k12 = STDEV('Xi')                      # Estimate Variance for Standardized
LET c4 = ((c2-k11)/k12)
SORT c4 c4.
CDF c4 c5;
    NORMAL 0 1.

```

Za

LET c6 = (loge ('F(x)')) / ('N' - 'i' + 0.5)

LET c7 = (loge(1- 'F(x)')) / ('i' - 0.5)

LET c8 = (c6+c7)

LET k13 = (- (Sum(c8)))

LET k14 = ((10*k13)-32)

NAME k13 'Za'

NAME k14 '10Za-32'

Zc

NAME k15 'Zc'

LET c9 = (1/'F(x')) - 1

LET c10 = (('N' - 0.5)/('i' - 0.75)) - 1

LET c11 = loge (c9/c10)

LET k15 = ssq (c11)

Zk

NAME k16 'Zk'

LET c12 = ('i' - 0.5) * (loge(('i' - 0.5)/('N' * 'F(x)')))

LET c13 = ('N' - 'i' + 0.5) * (loge(('N' - 'i' + 0.5) / ('N' * (1 - 'F(x)'))))

LET c14 = c12+c13

LET k16 = Maximum(c14)

A

NAME c15 'F(x)'

NAME c16 'log_A'

NAME k17 'A'

SORT 'F(x)' c15;

DESCENDING 'F(x)';

LET c16 = (2 * 'i' - 1) * (loge('F(x)') + loge(1 - 'F(x)')))

LET k17 = (- 'N' - ((1/'N')*(sum(c16))))

Francia - W'

WOPEN k3;

MERGE;

VARIABLE 1;

COLUMN 17.

LET c18 = (c17/SQRT(SSQ(c17))) * 'X(i)'

LET k18 = (SUM(c18))**2

LET c19 = 'X(i)' - Mean('X(i)')

LET k19 = k18/SSQ(c19)

NAME c19 'Xi-Xbar'

NAME k19 'Francia'

Wilk - W'

NAME c21 'X(j)'

NAME k21 'Wilk'

WOPEN k4;

MERGE;

VARIABLE 1;

COLUMN 20.

SORT 'X(i)' 'X(j)';

```

DESCENDING 'X(i)'.
LET c22 = c20 * ('X(j)' - 'X(i)')
LET k20 = (sum(c22))**2
LET k21 = k20/(ssq('Xi-Xbar'))
#####
PRINT '10Za-32' 'Zc' 'Zk' 'A' 'Francia' 'Wilk'
#####

```

ขนาดตัวอย่าง n=100

```

LET k2 = 100                # Sample size (n)
    # File Expected value of normal order stat(mi)
LET k3 = "D:\Random\Expected_Normal_Order\m100.txt"
RANDOM k2 c1;
    Beta 1.0 1.0.          # Random
NAME k2 'n'.
NAME c1 'Random'.
NAME c2 'Xi'.
NAME c3 'i'.
NAME c4 'X(i)'.
NAME c5 'F(x)'.
SORT c1 c2.
RANK c2 c3.
LET k11 = MEAN('Xi')      # Estimate Mean for Standardized
LET k12 = STDEV('Xi')     # Estimate Variance for Standardized
LET c4 = ((c2-k11)/k12)
CDF c4 c5;
    NORMAL 0 1.

```

Za

LET c6 = (loge ('F(x)')) / ('N' - 'i' + 0.5)

LET c7 = (loge(1- 'F(x)')) / ('i' -0.5)

LET c8 = (c6+c7)

LET k13 = (- (Sum(c8)))

LET k14 = ((10*k13)-32)

NAME k13 'Za'

NAME k14 '10Za-32'

Zc

NAME k15 'Zc'

LET c9 = (1/'F(x)) - 1

LET c10 = (('N' - 0.5)/('i' - 0.75)) - 1

LET c11 = loge (c9/c10)

LET k15 = ssq (c11)

Zk

NAME k16 'Zk'

LET c12 = ('i' - 0.5) * (loge(('i' - 0.5)/('N' * 'F(x)')))

LET c13 = ('N' - 'i' + 0.5) * (loge(('N' - 'i' + 0.5) / ('N' * (1 - 'F(x)'))))

LET c14 = c12+c13

LET k16 = Maximum(c14)

A

NAME k17 'A'

SORT 'F(x)' c15;

DESCENDING 'F(x)'.

LET c16 = (2 * 'i' - 1) * (loge('F(x)') + loge(1- 'F(xj)'))

LET k17 = (- 'N' - ((1/'N')*(sum(c16))))

```
##### Francia - W#####  
WOPEN k3;  
  MERGE;  
  VARIABLE 1;  
  COLUMN 17.  
LET c18 = (c17/SQRT(SSQ(c17))) * 'X(i)'  
LET k18 = (SUM(c18))**2  
LET c19 = 'X(i)' - Mean('X(i)')  
LET k19 = k18/SSQ(c19)  
NAME c19 'Xi-Xbar'  
NAME k19 'Francia'  
#####  
PRINT '10Za-32' 'Zc' 'Zk' 'A'  
#####
```