```mathematica
hedge = Flatten[Import["c:\\book1.txt", "Table"], 1];

Length[hedge]
```
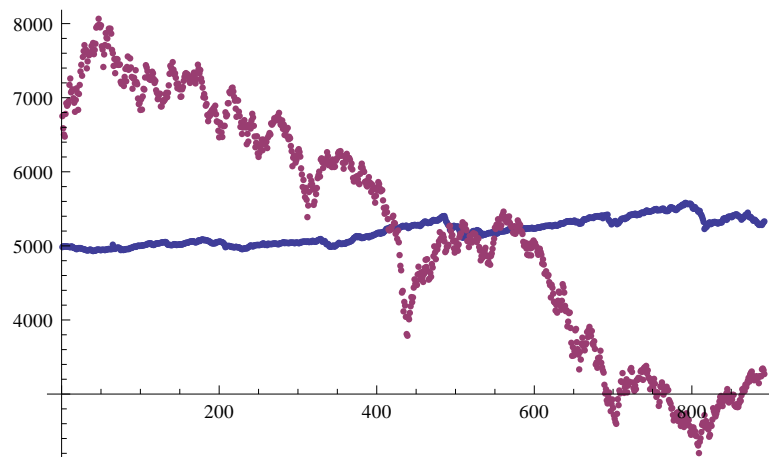
892

```mathematica
g = FinancialData["DAX", "1.1.2000"];

dax = Transpose[g][[2]][[1 ;; Length[hedge]]];

ListPlot[{hedge, dax}]
```



```mathematica
hedge = Log[hedge]; dax = Log[dax];

hedge = Differences[hedge];

dax = Differences[dax];

w = Transpose[{hedge, dax}];

w = Sort[w, #1[[1]] < #2[[1]] &];

hedge = Transpose[w][[1]];
dax = Transpose[w][[2]];

w[[2]]
```
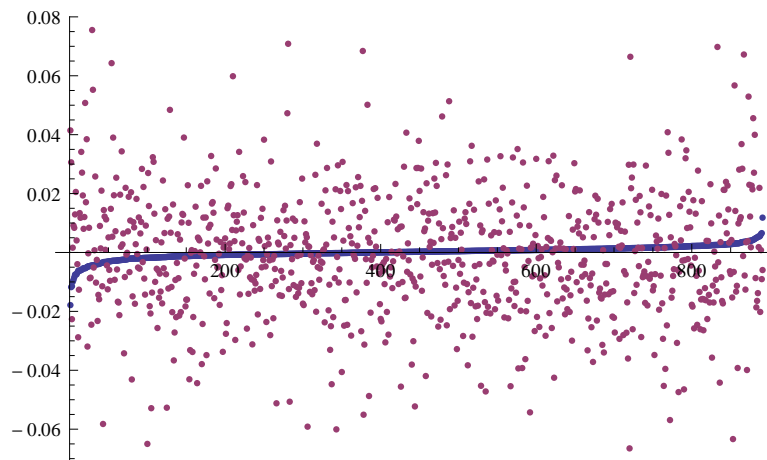
{-0.0117745, 0.0306036}

```
ListPlot[Transpose[w], PlotRange → All]
```



```
nN = 20; wN = Length[hedge];
m0 = Min[Transpose[w][[1]]]
Max[Transpose[w][[1]]]
m1 = Min[Transpose[w][[2]]]
Max[Transpose[w][[2]]]
f0 = (nN - 1) / (Max[Transpose[w][[1]]] - m0)
f1 = (nN - 1) / (Max[Transpose[w][[2]]] - m1)
d = 1 / wN // N
```

-0.0178719

0.0118256

-0.0665223

0.0755268

639.785

133.757

0.00112233

```
F = {}; For[i = 1, i ≤ wN, i++,
  For[j = 1, j ≤ wN, j++,
   m = 0;
   If[w[[j, 1]] <= w[[i, 1]] && w[[j, 2]] ≤ w[[i, 2]], m++;];
  ];
  AppendTo[F, {w[[i, 1]], w[[i, 2]], m / wN}];
]
```

$Aborted

```
U = {}; nN = 20; For[i = 0, i ≤ nN, i++,
 AppendTo[U, {min0, i / nN * (max1 - min1) + min1, 0}];
]
For[i = 0, i ≤ nN, i++,
 AppendTo[U, {i / nN * (max0 - min0) + min0, min1, 0}];
]
For[i = 0, i ≤ nN, i++,
 AppendTo[U, {max0, i / nN * (max1 - min1) + min1,
    Length[Select[w, #[[1]] <= max0 && #[[2]] <= i / nN * (max1 - min1) + min1 &]] / wN}];
]
For[i = 0, i ≤ nN, i++,
 AppendTo[U, {i / nN * (max0 - min0) + min0, max1,
    Length[Select[w, #[[2]] <= max1 && #[[1]] <= i / nN * (max0 - min0) + min0 &]] / wN}];
]

wN = Length[hedge];
min0 = Min[Transpose[w][[1]]];
max0 = Max[Transpose[w][[1]]];
min1 = Min[Transpose[w][[2]]];
max1 = Max[Transpose[w][[2]]];

U = {}; sdax = Sort[dax]; AppendTo[U, {max0, max1, 1}];

For[i = 1, i ≤ wN, i++,
  // AppendTo[U, {hedge[[i]], max1, (i - 1) / wN}];
 AppendTo[U, {max0, sdax[[i]], (i - 1) / wN}];
 AppendTo[U, {min0, sdax[[i]], 0}];
]

F = {}; For[i = 1, i ≤ wN, i++,
 AppendTo[F, {w[[i, 1]], w[[i, 2]],
    Length[Select[w, #[[1]] < w[[i, 1]] && #[[2]] < w[[i, 2]] &]] / wN}];
]

W = Join[F, U];
```
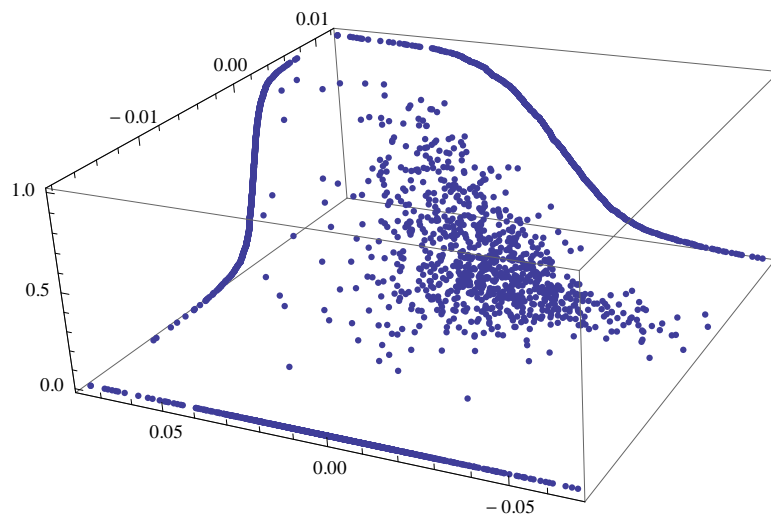
ListPointPlot3D[W]


```
ww = {};
For[i = 1, i ≤ wN, i++,
 AppendTo[ww, Select[W, #[[2]] == sdax[[i]] &]];
]
```
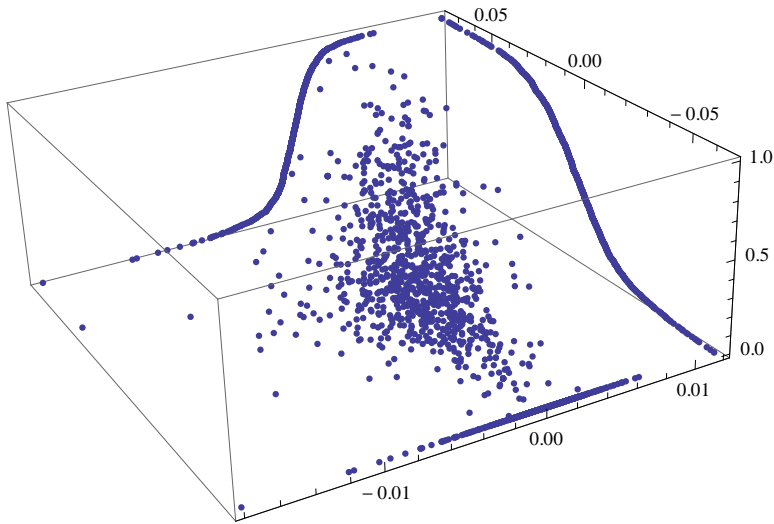
```
Length[W]
Length[Flatten[ww, 1]]
```
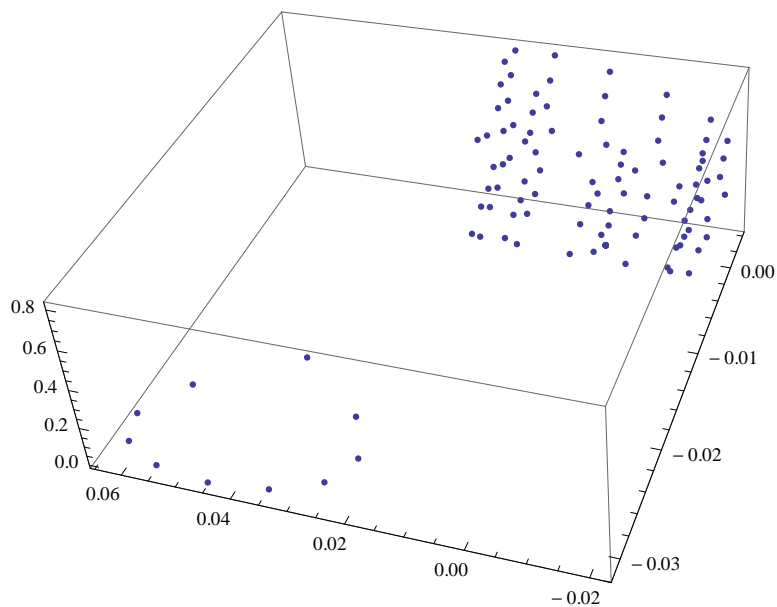
3565

0

```
ww[[1]]
```

{{-0.0178719, 0.041439, 0}, {-0.0178719, 0.0755268, 0}, {-0.0178719, -0.0665223, 0}}

```
ListPointPlot3D[Flatten[ww, 1]]
```



```
Po[a_, b_] := If[b == 0, 1, If[b == -1, 0, a ^ b]];

B[n_, i_, x_] := Binomial[n, i] Po[x, i] Po[1 - x, n - i];

nn = Length[ww]
```

891

```
f[a_, b_] := Sum[B[nn, i, a] Sum[ww[[i + 1, j + 1]] B[Length[ww[[j]]], j, b],
      {j, 0, Length[ww[[j]]] - 1}] // N, {i, 0, nn - 1}]

f[0, 0]
```

{-0.0178719, 0.041439, 0.}

```
nnn = 10; pl = Flatten[Table[f[i / nnn, j / nnn], {i, 0, nnn}, {j, 0, nnn}], 1];

pll = Select[pl, Head[#] == Head[{0.`, 0.`, 0.`}] &];
```
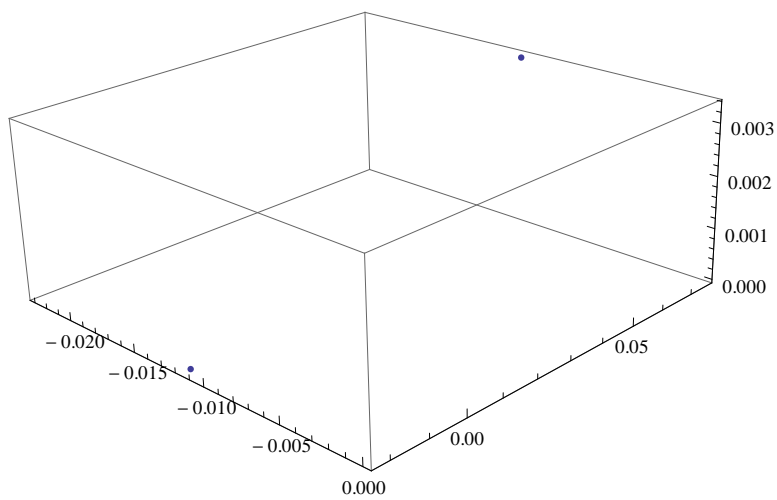
ListPointPlot3D[pll]

Select[W, #[[1]] == hedge[[3]] &]

$$\left\{ \{-0.0114726, -0.0226471, 0\}, \left\{-0.0114726, 0.0755268, \frac{2}{891}\right\} \right\}$$

ListPointPlot3D[Select[W, #[[1]] == hedge[[3]] &]]

w[[2]]

Length[Flatten[w, 1]]

891

Length[W]

4455

ListPlot[hrand]
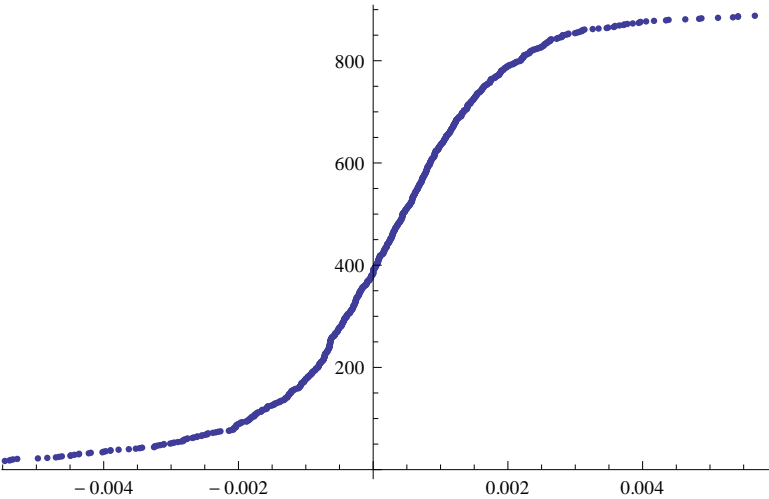
nn = Length[hedge]

891

F[[1, 1]]

{-0.0665223, -0.0178719, 0}

ListPlot[Transpose[Transpose[Q][[1 ;; 2]]]]
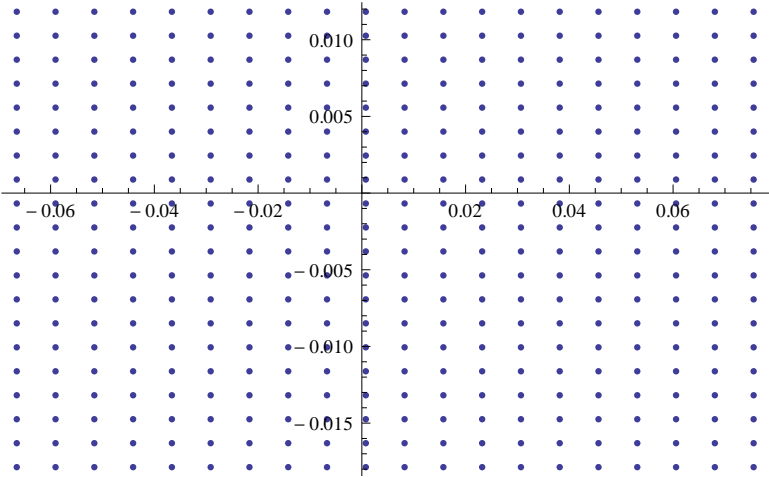
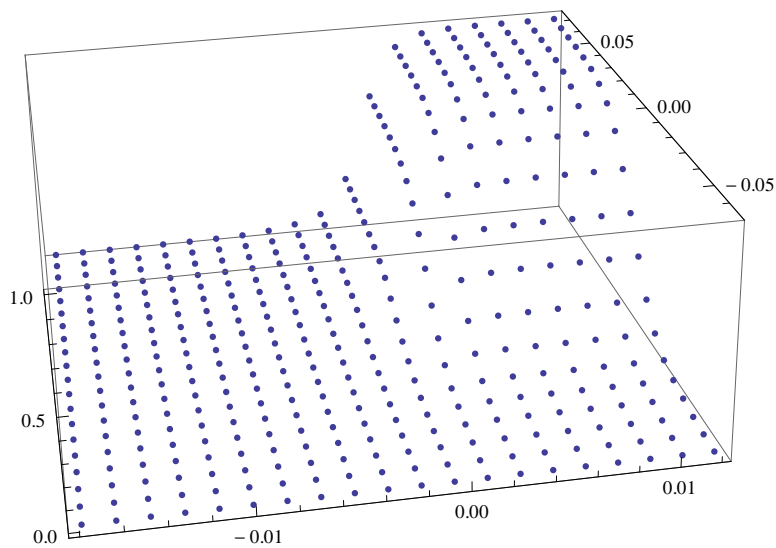**w[[1]]**

{0.041439, -0.0178719}

```
F = Table[{m0 + i / f0, m1 + j / f1, 0}, {i, 0, nN - 1}, {j, 0, nN - 1}]; For[i = 1, i ≤ nN, i++,
 For[j = 1, j ≤ nN, j++,
  For[k = 1, k ≤ wN, k++,
   If[w[[k, 2]] ≤ F[[i, j, 2]] && w[[k, 1]] ≤ F[[i, j, 1]] , F[[i, j, 3]] += d;];
  ]
 ]]; Q = Flatten[F, 1];
```
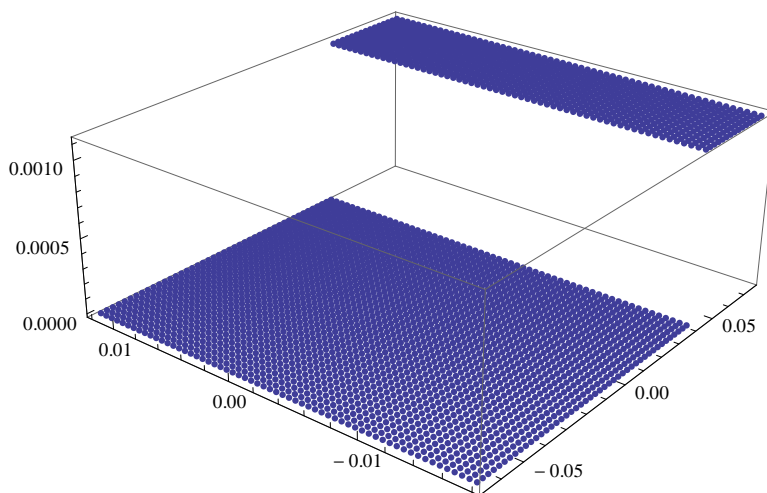
```
ListPointPlot3D[Q]
```



```
w = Import["c:\\Trivariat.txt", "Table"];
```

```
Length[w]
```

216 000

```
Length[w]^(1 / 3)
```

60

```
w[[8000]]
```

{-0.016865, -0.035223, -0.008308, 0.}

```
w1 = Select[w, #[[1]] == w[[1000, 1]] &];
```

```
fif = Transpose[Transpose[w1][[2 ;; 4]]];
```

```
ListPointPlot3D[fif]
```



```
u = 60;
```

```
fi = {}; For[i = 0, i < u, i ++,
 AppendTo[fi, fif[[i * u + 1 ;; (i + 1) * u]]];
]
```

```
fif[[21 ;; 40]]
```

{{-0.059046, -0.017872, 0.}, {-0.059046, -0.016309, 0.},
 {-0.059046, -0.014746, 0.}, {-0.059046, -0.013183, 0.}, {-0.059046, -0.01162, 0.},
 {-0.059046, -0.010057, 0.}, {-0.059046, -0.008494, 0.}, {-0.059046, -0.006931, 0.},
 {-0.059046, -0.005368, 0.}, {-0.059046, -0.003805, 0.}, {-0.059046, -0.002242, 0.},
 {-0.059046, -0.000679, 0.}, {-0.059046, 0.000884, 0.}, {-0.059046, 0.002447, 0.},
 {-0.059046, 0.00401, 0.}, {-0.059046, 0.005573, 0.}, {-0.059046, 0.007136, 0.},
 {-0.059046, 0.0087, 0.}, {-0.059046, 0.010263, 0.}, {-0.059046, 0.011826, 0.}}

```
fi[[1, 13]]
```

{-0.066522, -0.011832, 0.}

```
Po[a_, b_] := If[b == 0, 1, If[b == -1, 0, a ^ b]];
```

```
nn = Length[fi]
```

60

```
bi = Table[Binomial[nn - 1, i], {i, 0, nn - 1}];
```

```
B[n_, i_, x_] := bi[[i + 1]] Po[x, i] Po[1 - x, n - 1 - i];
```

```
f[a_, b_] := Sum[B[nn, i, a] B[nn, j, b] fi[[i + 1, j + 1]], {i, 0, nn - 1}, {j, 0, nn - 1}];
```
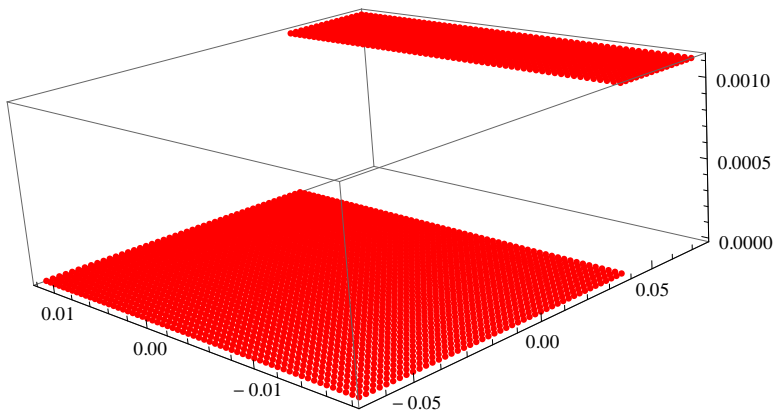
```
f[0.1, 0.1]
```

{-0.0523174, -0.0149022, 3.53251 × 10^{-36}}

```
an = 15; tt = Table[f[i / an, j / an], {i, 0, an}, {j, 0, an}];
```

```
tt = Flatten[tt, 1];
```
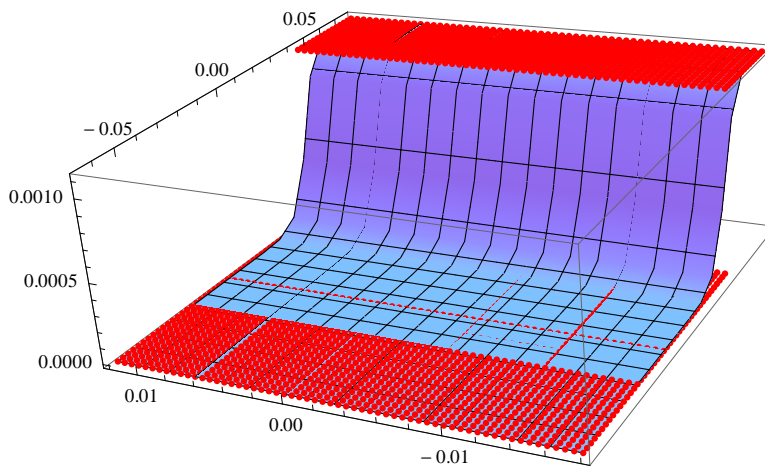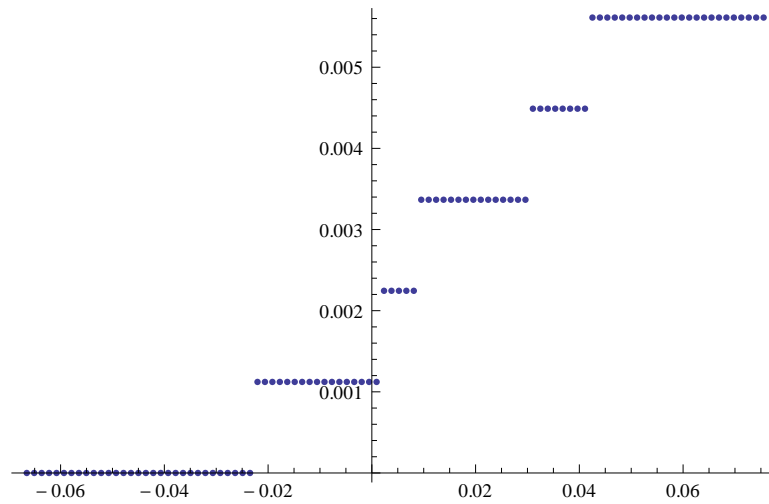
```
ListPointPlot3D[fif, PlotStyle → Red]
```



```
Show[ListPointPlot3D[fif, PlotStyle → Red], ListPlot3D[tt]]
```
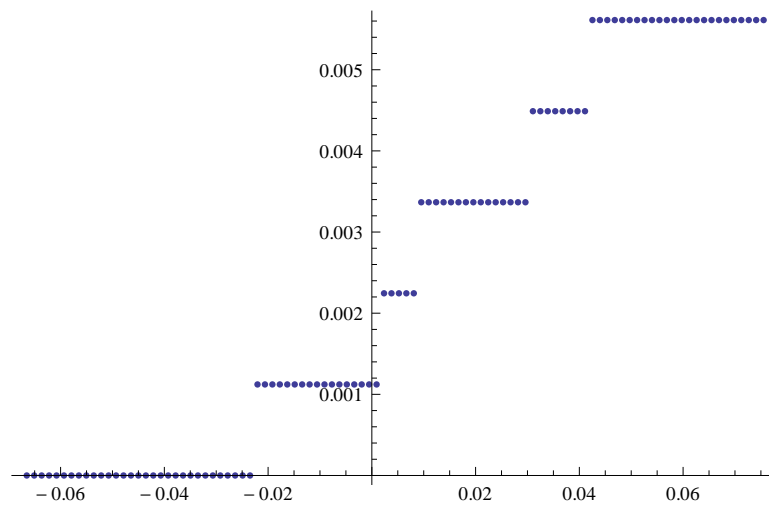
```
p = 3000; ListPlot[{#[[2]], #[[3]]} & /@ Select[w, #[[1]] == w[[p, 1]] &]]
```



```
ll = {#[[2]], #[[3]]} & /@ Select[w, #[[1]] == w[[p, 1]] &];
```

```
ListPlot[ll]
```



```
Max[Table[w[[k, 3]] - Q[[k, 3]], {k, nN ^ 2}]]
```

4.74747×10^{-7}