

# Time Cost of nGrangerT

November 20, 2014

## 1 Correlation Stage Time Cost

```
X=randn(500,1e5); tic; R=getcovpd(X, 20); toc
```

1e5, sec	p=10	20	50	100	200	500	1000	$O(p^2 \cdot m \cdot L)$
od=20	0.0575	0.124	0.272	1.339	3.96	17.02	59.7	
od=40	0.096	0.223	0.494	2.67	7.71	32.14	118.1	$O(p^{1.9} \cdot m \cdot L)$

Table 1: getcovpd(), farxhp7, octave

Note:

- Matlab (2012b) will be 33% slower in these cases.
- getcovzpd() (for positive defined result) cost roughly the same time.

1e5, sec	p=10	20	50	100	200	500	1000
od=20	0.250	0.526	0.959	1.966	4.63	17.73	53.2
od=40	0.486	0.922	1.786	3.792	8.90	35.1	104.0

Table 2: getcovpd(). fardell, Matlab 2014a

## 2 Regression Stage Time Cost

```
tic; gc=RGrangerT(R); toc
```

sec	p=10	20	50	100	200	500	$O(p^4 m^3)$
od=20	0.022	0.168	2.44	24.2	243.6	6870.3	
od=40	0.082	0.463	12.0	120.4	1358.2	oom	$O(p^{3.6} m^{2.3})$

Table 3: RGrangerT, farxhp7, octave

```
tic; gcq=RGrangerTfast(R); toc
```

sec	p=10	20	50	100	200	500	$O(p^3m^3)$
od=20	0.013	0.039	0.185	0.721	4.06	52.1	
od=40	0.038	0.105	0.736	4.63	27.2	oom	$O(p^{2.8}m^{2.7})$

Table 4: RGrangerTfast, farxhp7, octave

1

Note:

RGrangerTfast:  $p = 500$ ,  $m = 20$ , time cost: 13.2sec in Solving  $A$ , 37.9sec in inverting  $covz$ , 0.11sec in geting GC. (Do a  $covz * covz$  will cost 25.7sec);

For Matlab (2012b),  $p = 500$ ,  $m = 20$ , time cost: 7.7sec in Solving  $A$ , 155.7sec in inverting  $covz$ , 0.17sec in geting GC; Which is, about 200% slower. (Do a  $covz * covz$  will cost 23.3sec)

sec	p=10	20	50	100	200	500	1000
od=20	0.020	0.125	1.251	9.73	104.5	2805.6	
od=40	0.084	0.395	4.617	47.1	534.7	16330.8	

Table 5: RGrangerT, fardell, Matlab 2014a

sec	p=10	20	50	100	200	500	1000	
od=20	0.008	0.055	0.133	0.598	2.639	27.2	192.4	
od=40	0.071	0.116	0.555	2.503	15.1	188.1	1434.1	

Table 6: RGrangerTfast, fardell, Matlab 2014a

### 3 RGrangerTLevinson

```
tic ; gcq2=RGrangerTLevinson(R); toc
```

sec	p=10	20	50	100	200	500	1000	$O(p^3m^2 \log m)$
od=20	0.018	0.044	0.1296	0.434	1.987	19.5	110.5	
od=40	0.044	0.101	0.3745	1.662	8.353	76.9	433.9	

Table 7: RGrangerTLevinson(). farxhp7, octave

### 4 BlockLevinson

1e5, sec	p=10	20	50	100	200	500	1000	$O(p^3m^2)$
od=20	0.006	0.008	0.030	0.130	0.592	5.18	32.0	
od=40	0.011	0.023	0.095	0.474	2.006	19.36	117.9	$O(p^{2.6}m^{1.9})$

Table 8: BlockLevinson(). farxhp7, octave

---

<sup>1</sup>oom: out-of-memory, 8GB for farxhp7

## 5 CP

nGrangerT

$$O(p^2 \cdot m \cdot L) + O(p^4 m^3)$$

nGrangerTfast

$$O(p^2 \cdot m \cdot L) + O(p^3 m^3)$$

nGrangerTLevinson (not implemented)

$$O(p^2 \cdot m \cdot L) + O(p^3 m^2)$$

PDC, freqdecomposition based (not implemented)

$$O(p^2 \cdot L \cdot \log N) + O(p^3 N + p^2 N \log N)$$

.

.

.

.

.

.

.

.

.