The LAPIS (Low-rank Approximation via Partially Imputed Svd) Algorithm

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Simulations

Parameters

- Number of Ls: 1
- Draws per L: 250
- Number of Units: 150
- Number of Control Units: 145
- Number of Times: 500
- Number of pre-treatment Times: 490
- Rank of L: 10
- Autocorrelation Parameter: 0
- True Effect Size for Constant Effect: 10
- Error Type: gaussian
- Error Variance (if Gaussian error): 16
- Degrees of freedom (if t-error): 5
- Exchangable: FALSE
- Penalized: TRUE
- Rank Estimation Method: threshold
- Scaling for L: 5
- Treatment Effect Type: decay
- Treatment Design: staggered_adoption
- Lag Structure (if using staggered adoption structure): random
- Average Treatment Length (if using staggered adoption structure, with random adoption): 4
- Maximum lag: 4

Our Method vs Competitors, Fixed Parameters

Results

Signal to Noise Ratio

```
## [1] 41.61998
```

mse for DID

```
##      mse
## 18.08978
```

Se for mse for DID

```
##    se_mse
## 0.3333425
```

mse for SC

```
##      mse
## 119.8542
```

Se for mse for SC

```
##   se_mse
## 1.894608
```

mse for our Method (Explicit Tau)

```
##      mse
## 12.14962
```

Se for mse for our Method (Explicit Tau)

```
##  se_mse
## 0.45472
```

mse for SDID

```
##      mse
## 165.2896
```

Se for mse for SDID

```
##   se_mse
## 2.340446
```

mse For Our Method (Not Explicit Tau)

```
##      mse
## 12.14962
```

Se for mse for Our Method (Not Explicit Tau)

```
##    se_mse
## 0.4547198
```

mse For Oracle (Perfect L)

```
##      mse
## 10.7951
```

mse For Oracle (Perfect L)

```
##     se_mse
## 0.4258879
```

Matrix Bias vs Reduction in Variance due to Averaging

For more general designs of W (like the block design scheme considered here) we allow a block in the bottom right hand corner of W to be non-zero. When implementing our method, we have two competing effects on estimation:

- The bias that's introduced by making more of the Y_{ij}s zero.
- The help we get with estimating τ by being able to average over cells (because we asmeane *tau*) is the same for all units and times.

It would appear that accurracy increases for estimating τ to a point, and then decreases when the bias introduced by replacement of cells with 0 in Y becomes too great.

Influence of N_0/N on Performance

Influence of ρ on Performance

Influence of τ on Performance

Influence True Rank on Performance

Influence of Rank Error on Performance