

Postgraduate course  
in  
**Evaluation and comparison of method  
of measurements**

**A solution to exercise 2a**

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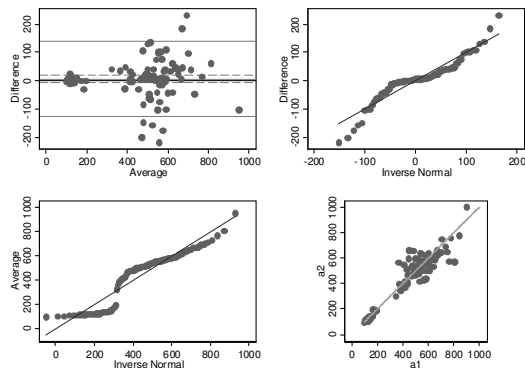
**Exercise 2a:**

**Two type of devices, two devices of the same  
type:**

The activated coagulation time (ACT) has come into widespread use in the catheterization laboratory as an assay of whole blood clotting time which can be performed rapidly at the bedside.

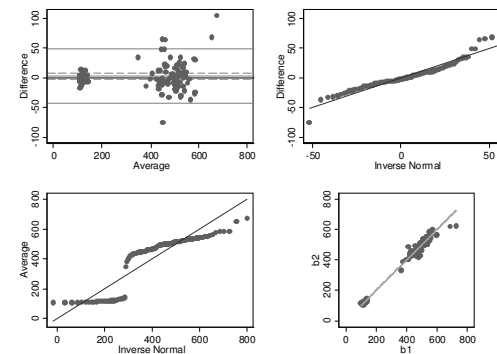
The purpose of the present study was to compare and evaluate two types of devices measuring ACT

**Device A: Figures.**



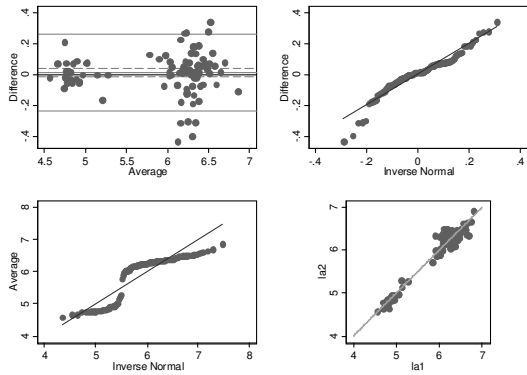
Bias?? Limits of agreement ??  
'diag-plot'?? Normal distribution??

**Device B: Figures.**



Bias?? Limits of agreement ??  
'diag-plot'?? Normal distribution??

### Device A: Figures (ln (time)).

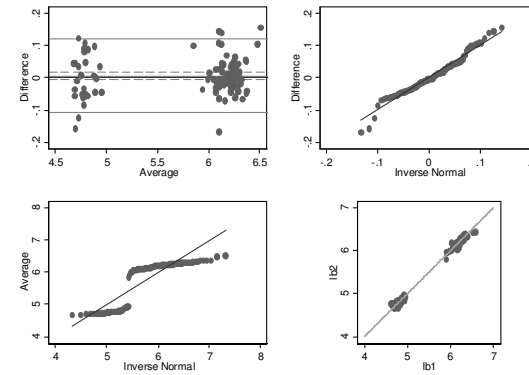


Bias?? Limits of agreement ??  
 'diag-plot'?? Normal distribution??

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### Device B: Figures (ln (time)).

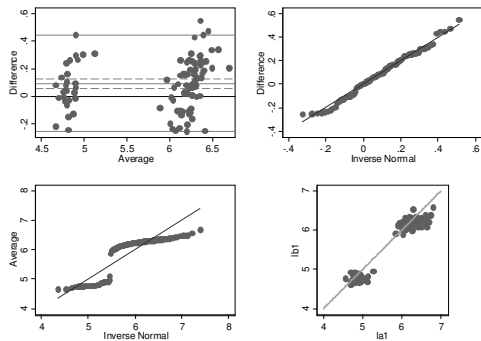


Bias?? Limits of agreement ??  
 'diag-plot'?? Normal distribution??

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### Comparing Device A and B: Figures (ln (time)).



Bias?? Limits of agreement ??  
 'diag-plot'?? Normal distribution??

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### Exercise 2a:

**Conclusion from the analysis of all data (ln transformed):**

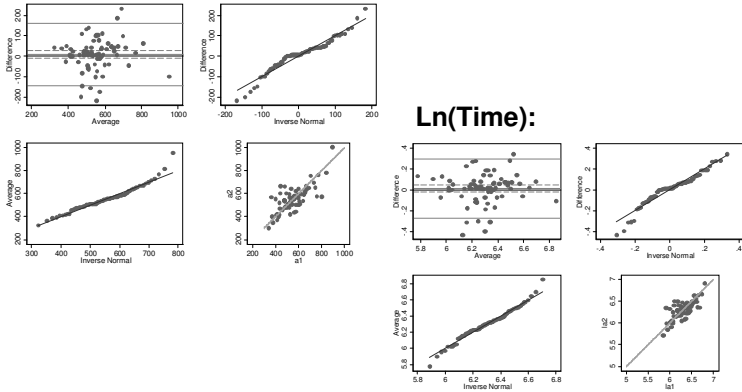
**ACT measured by device A is longer compared to device B.**

**Type A seems to have larger measurement error; this can be tested:**

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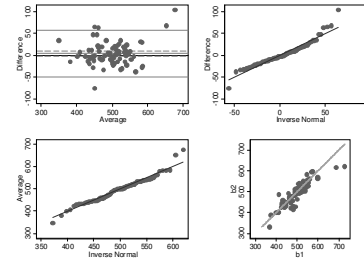
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**Device A: Figures (ACT>220).**



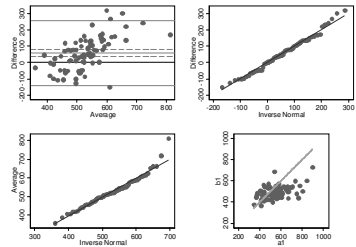
**Ln(Time):**

**Device B: Figures (ACT>220).**



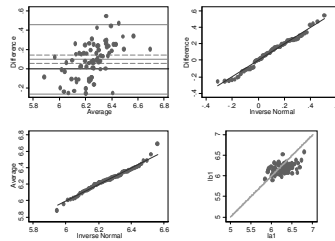
**Ln(Time):**

**Device A vs B: Figures (ACT>220).**

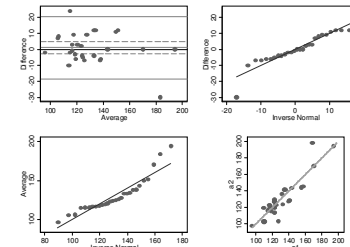


**Ln(Time):**

Correlation  $r=0.61$ ,  $\rho=0.65$

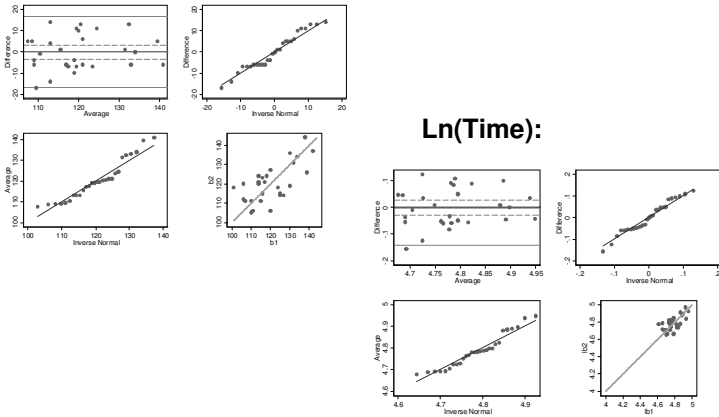


**Device A: Figures (ACT<220).**



**Ln(Time):**

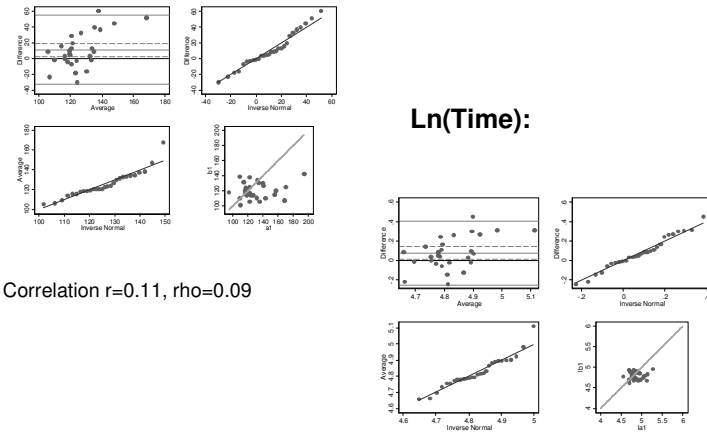
### Device B: Figures (ACT<220).



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### Device A vs B: Figures (ACT<220).



Correlation  $r=0.11$ ,  $\rho=0.09$

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### Estimating inter / intra observer variation (Ln(time))

```
xi: xtmixed ltime i.deviceType ||id: || deviceType: if time>220 ,
residuals(independent, by(deviceType))
>220
```

ltime	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_deviceType~2	<b>-.0957467</b>	.0160076	-5.98	0.000	-.127121	-.0643723
_cons	6.295144	.0174111	361.56	0.000	6.261019	6.329269

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
<b>id: Identity</b>				
sd(_cons)	.1031763	.012291	.081692	.1303109
<b>deviceType: Identity</b>				
sd(_cons)	<b>.0799049</b>	.0108781	.0611917	.1043407
<b>Residual: Independent, by deviceType</b>				
1: sd(e)	<b>.1096276</b>	.0103579	.0910953	.1319301
2: sd(e)	<b>.0373043</b>	.0029743	.0319074	.043614

LR test vs. linear regression:       $\chi^2(3) = 237.92$       Prob >  $\chi^2 = 0.0000$

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### Inter / intra device comparison:

Bias (type 2 - type 1) -9.6%

inter device sd 8.0%

intra device sd (type 1) 11.0%

intra device sd (type 2) 3.7%

### Limits of agreements

	Low	High
intra device 1	-30.5%	30.5%
intra device 2	-10.3%	10.3%
inter devices (type 1 - type 2)	-22.2%	41.4%
inter devices (type 1 - type 2) 2 repetitions	-17.8%	37.0%

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## Estimating inter / intra observer variation (ln(time))

```
xi: xtmixed ltime i.deviceType ||id: || deviceType: if time<220 ,
residuals(independent, by(deviceType))
```

<220

ltime	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
_IdeviceTy~2	<b>-.0722338</b>	.03225	-2.24	0.025	-.1354426	-.0090249
_cons	4.856773	.0237926	204.13	0.000	4.81014	4.903405

Random-effects Parameters		Estimate	Std. Err.	[95% Conf. Interval]	
id: Identity	sd(_cons)	<b>.0348089</b>	.0435974	.0029894	.405324
deviceType: Identity	sd(_cons)	.1152447	.0172868	.0858895	.1546328
Residual: Independent, by deviceType					
	1: sd(e)	<b>.0521055</b>	.0073625	.0395011	.0687317
	2: sd(e)	<b>.0490224</b>	.006274	.0381466	.0629989