Linguistic Convergence Supreme Court Oral Arguments

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1 Introduction

2 Convergence Calculations

Setting for ABA

- ABA triplets.
- The first segement with speaker A speaking is referenced with A_1
- The second segment with speaker B's response to speaker A is referenced by B
- The thrid segement with speaker A's response to speaker B is referenced A_2.
- We define average formants for a segment. Specifically, for $j = 1$ or $j = 2$,

$$\bar{f}_j(ABA) = \frac{1}{n_{ABA}} \sum_{v \in ABA, v=C} f_j(v)$$

where v is the set of vowels in ABA of type C

- Eg. $C =$ AA, AE, UH, etc

Setting for ABA

- AxByA triplets. Only judges can be A, B. Lawyers can be x, y. Or x, y can be empty.
- The first segement with speaker A speaking is referenced with A_1
- The second segment with speaker B's response to speaker A is referenced by B
- The thrid segement with speaker A's response to speaker B is referenced A_2.
- We define average formants for a segment. Specifically, for $j = 1$ or $j = 2$,

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Convergence Definition

$$\mathbf{E}[f_j - \bar{f}_j(A_1)|\bar{f}_j(A1), \bar{f}_j(B)]$$
$$= \mathbf{conv} \cdot [\bar{f}_j(B) - \bar{f}_j(A_1)] + \gamma \cdot \bar{f}_j(A_1)$$

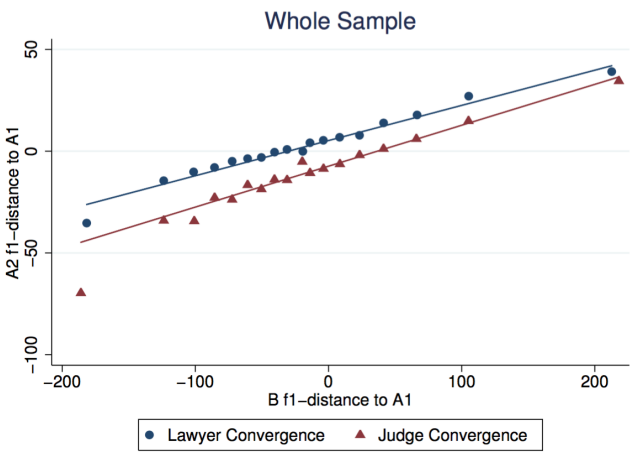
- Convergence, **conv** defined by above
- γ is an auxiliary parameter also defined by above
- f_j is the formant of any vowel in the A2 segment of any ABA

Convergence Estimation

- Least squares.
- Allows quantification of uncertainty about estimates.
- Standard errors allow random noise to be correlated arbitrarily throughout an oral argument.

$$\widehat{\textbf{conv}} = \underset{\delta}{\text{argmin}} \min_{\gamma} \sum_{d=1}^{D} \sum_{\alpha \in D} \sum_{C \in \mathcal{C}} \sum_{v \in A_2(\alpha): v \in C}$$

$$\left[f_j(v) - \delta \cdot [\bar{f}_j(B) - \bar{f}_j(A_1)] - \gamma \cdot \bar{f}_j(A_1) \right]^2$$


Whole Sample
A2 f1−distance to A1
50
0
−50
−100
−200
−100
0
100
200
B f1−distance to A1
Lawyer Convergence
Judge Convergence

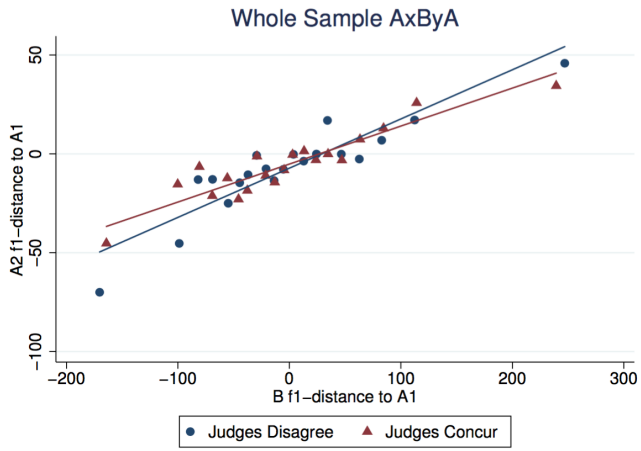

Whole Sample AxByA
A2 f1−distance to A1
50
0
−50
−100
−200
−100
0
100
200
300
B f1−distance to A1
Judges Disagree
Judges Concur

Table: ABA Basic Convergence Parameters

	F1 Estimate	(S.E.)	F2 Estimate	(S.E.)
	I. Overall (Non Directional)			
Overall	0.175	(0.003)	0.156	(0.003)
	II. Lawyer $\longrightarrow$ Judge			
Overall	0.213	(0.005)	0.187	(0.005)
Winning Lawyer	0.222	(0.006)	0.186	(0.006)
Losing Lawyer	0.205	(0.009)	0.188	(0.006)
	III. Judge $\longrightarrow$ Lawyer			
Overall	0.190	(0.004)	0.151	(0.003)
Winning Lawyer	0.200	(0.006)	0.157	(0.004)
Losing Lawyer	0.181	(0.006)	0.146	(0.004)

This table presents the basic estimate of convergence parameters. All vowels are treated symmetrically with a single convergence parameters. Panel I calculates convergence on the entire sample. Panel II restricts to ABA triples where the lawyer is speaker A. Panel III restricts to ABA triples where the lawyer is speaker B.

Table: AxByA Basic Convergence Parameters

	F1 Estimate	(S.E.)	F2 Estimate	(S.E.)
	I. Overall			
Overall	0.363	(0.007)	0.339	(0.006)
	II. By Decision			
Concurring	0.374	(0.007)	0.359	(0.007)
Not Concurring	0.227	(0.032)	0.159	(0.020)

This table presents the basic estimate of convergence parameters. All vowels are treated symmetrically with a single convergence parameters. Panel I calculates convergence on the entire AxByA sample. Panel II considers AxByA triples on concurring and non concurring judges separately.

Table: AxByA Context Specific Convergence Parameters

	F1 Estimate	(S.E.)	F2 Estimate	(S.E.)
		I. Overall		
Overall	0.351	(0.017)	0.351	(0.011)
		II. By Decision		
Concurring	0.362	(0.019)	0.374	(0.010)
Not Concurring	0.155	(0.027)	0.102	(0.037)

Table: ABA Convergence By Gender

	F1 Estimate	(S.E.)	F2 Estimate	(S.E.)
	I. Male $\longrightarrow$ Female			
Judge $\rightarrow$ Lawyer, Lawyer Wins	0.203	(0.016)	0.284	(0.013)
Judge $\rightarrow$ Lawyer, Lawyer Loses	0.217	(0.016)	0.235	(0.018)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.190	(0.009)	0.186	(0.007)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.216	(0.010)	0.209	(0.007)
	II. Male $\longrightarrow$ Male			
Judge $\rightarrow$ Lawyer, Lawyer Wins	0.271	(0.010)	0.312	(0.008)
Judge $\rightarrow$ Lawyer, Lawyer Loses	0.272	(0.008)	0.304	(0.083)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.238	(0.010)	0.290	(0.007)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.260	(0.008)	0.300	(0.007)
	III. Female $\longrightarrow$ Female			
Judge $\rightarrow$ Lawyer, Lawyer Wins	0.267	(0.026)	0.294	(0.036)
Judge $\rightarrow$ Lawyer, Lawyer Loses	0.299	(0.035)	0.270	(0.036)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.260	(0.027)	0.285	(0.029)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.322	(0.035)	0.258	(0.020)
	IV. Female $\longrightarrow$ Male			
Judge $\rightarrow$ Lawyer, Lawyer Wins	0.290	(0.040)	0.322	(0.015)
Judge $\rightarrow$ Lawyer, Lawyer Loses	0.323	(0.020)	0.294	(0.018)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.333	(0.029)	0.369	(0.024)
Lawyer $\rightarrow$ Judge, Lawyer Wins	0.310	(0.020)	0.373	(0.019)

Table: ABA Vowel Specific Convergence Parameters : Monopthongs

	F1		F2	
	Estimate	(S.E.)	Estimate	(S.E.)
	I. Overall			
AA	-0.0121	(0.0106)	0.0525	(0.0105)
AE	-0.00160	(0.0239)	0.0772	(0.0328)
AH	0.00662	(0.0120)	0.0481	(0.00942)
AO	0.0398	(0.00918)	0.0573	(0.00565)
EH	0.0495	(0.0143)	0.0733	(0.0107)
ER	0.0439	(0.0101)	0.0534	(0.00615)
IH	0.0999	(0.00515)	0.100	(0.00376)
IY	0.169	(0.0117)	0.130	(0.00820)
UH	0.105	(0.00608)	0.0971	(0.00403)
UW	0.0704	(0.0139)	0.110	(0.0170)

This table presents the vowel-specific estimates of convergence parameters in the ABA dataset.

Table: AxByA Vowel Specific Convergence Parameters : Monopthongs

	F1 Estimate	(S.E.)	F2 Estimate	(S.E.)
	I. Overall			
AA	0.275	(0.0518)	0.238	(0.0477)
AE	-0.211	(0.112)	-0.0112	(0.122)
AH	0.294	(0.0550)	0.246	(0.0519)
AO	0.291	(0.0210)	0.208	(0.0207)
EH	0.0336	(0.0994)	-0.0228	(0.0547)
ER	0.307	(0.0212)	0.225	(0.0222)
IH	0.24	(0.0251)	0.307	(0.0144)
IY	0.104	(0.0349)	0.0334	(0.0458)
UH	0.247	(0.0267)	0.335	(0.0140)
UW	0.219	(0.0451)	0.238	(0.0442)

This table presents the vowel-specific estimates of convergence parameters in the AxByA dataset.