

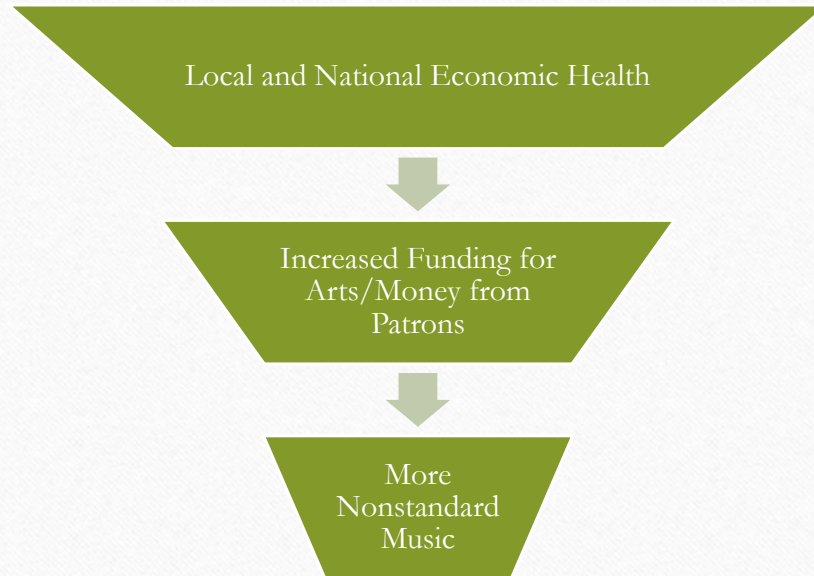
# Beethoven, Bach, and Brahms in Bull/Bear Markets

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The Influence of Economic Health on Music  
Selection at the Symphony

Mark Llorente

# Background



[Journal of Cultural Economics](#)  
August 2011, 35:167

## Factors that influence programming decisions of US symphony orchestras

### Abstract

Program decisions by symphony orchestra management are influenced by various factors. To examine these factors, we create an objective index of the propensity of a symphony orchestra to perform the standard repertoire. We use regression analysis to examine factors that influence programming decisions of 64 US symphony orchestras in 2006–2007, including public and private sources of funding. We find that increased funding from ticket sales, endowments, and local government increases the likelihood that an orchestra will perform nonstandard repertoire. In addition, the results suggest that a symphony orchestra's music director does not have a significant impact on the degree of program conventionality.



# Data Sources

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- Symphony Selections
  - New York Philharmonic Program Database
- Economic Indicators
  - National Endowment of the Arts Employment Data
  - Federal Reserve Indices
  - Federal Reserve Bank of New York Indices

# Our Metric: Unconventionality

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- Program considered unconventional if it features infrequently performed composers and pieces
  - “Penalize” commonly performed works
  - “Penalize” regularly played seasonal works, e.g. Handel’s Messiah



# Our Metric: Unconventionality

$$= \frac{\frac{\text{Work Unconventionality}}{1}}{\text{Work Title Count in Corpus}} \times \frac{\frac{1}{1}}{\text{Composer Count in Corpus}}$$

$$\text{Program Unconventionality} = \frac{\sum \text{Work Unconventionality}}{N_{\text{works\_in\_program}}}$$

$$\text{Season Unconventionality} = \frac{\sum \text{Program Unconventionality}}{N_{\text{programs\_in\_season}}}$$

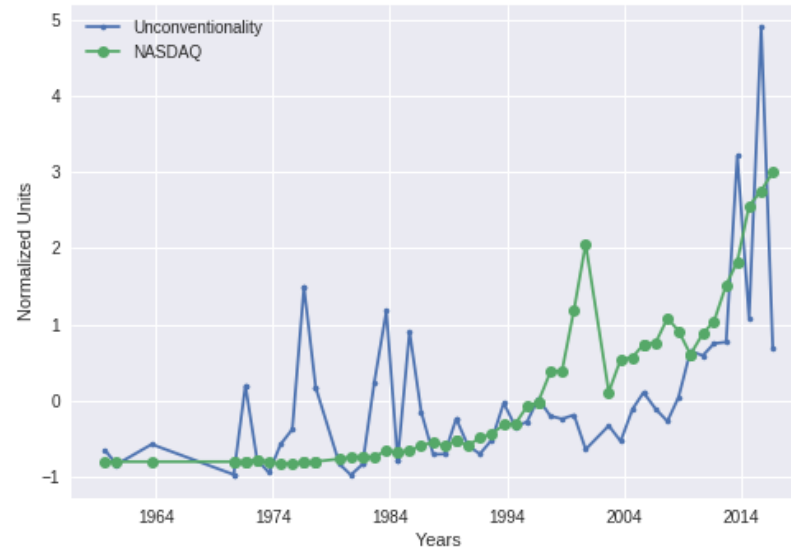
- Unconventionality By Program

- mean: 0.0055, median: 0.00005
- std: 0.0186
- min: ~0.0, max: 0.250

- Unconventionality By Season

- mean: 0.0081, median: 0.005076
- std: 0.0084
- min: 0.0003, max: 0.0047

# Economic Indicators and NY Phil Program Unconventionality at a Glance





# Methods

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- Models:

- Random Forest\*
  - PCA Matrix Decomposition to Minimize Redundant Splits
- Logistic Regression\*

\*Label of “True” if  
Unconventionality > Median

- Model Validation

- Time Series Split Instead of Cross Validation to Predict Forward in Time

- Model Scoring

- Recall, Precision, F1

# Baseline Model vs Best Model

	By Program			By Season		
	F1	Recall	Precision	F1	Recall	Precision
Baseline Logistic Regression	0.64	0.8	0.53	0.82	0.75	0.92
Baseline Random Forest	0.35	0.30	0.42	0.62	0.5	0.80
Logistic Reg with Change Over 28 Days	0.61	0.70	0.54	0.84	0.81	0.87
Random Forest with Change Over 28 Days	0.58	0.5	0.71	0.71	0.63	0.83



# Conclusions

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- Season most relevant target for predicting conventionality
- *Changes* in market affect conventionality
  - $\Delta 28\_Days$  NYC Coincident Economic Index Strongest Feature
    - Local matters!
- Next Step:
  - Expand data to other symphonies

# Thank You!

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[https://github.com/markcatalysis/ny\\_phil\\_selection](https://github.com/markcatalysis/ny_phil_selection)