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# Dynamic of phonographic markets. Record industry stochastic model and empirical data

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Stockholm  
University



# Agenda



- Introduction to record industry
- Hierarchical structure of phonographic market
- Record sales stochastic model



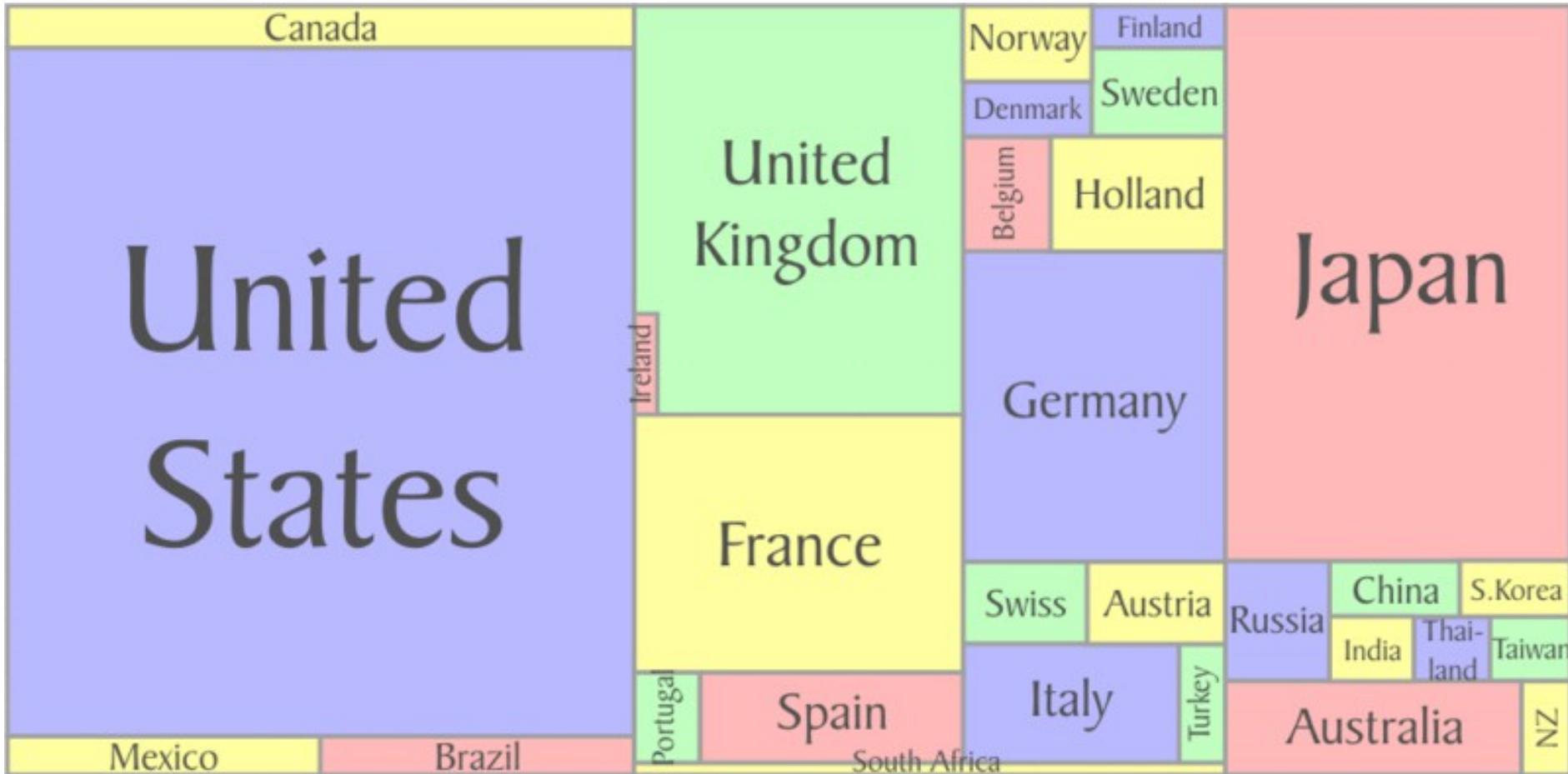
# Introduction to record industry



- Tygodniowe wyniki sprzedaży (lista 200 najlepiej sprzedających się płyt) od 2003 zbierane przez IFPI (International Federation of the Phonographic Industry)
- Rynek muzyczny kurczy się od 2000 po kilka procent rocznie do 28 do 16 miliardów USD
- Cyfryzacja na masową skalę jako sposób walki o utrzymanie dochodu (wzrost marży)
- 80% rynku opanowane przez 4 firmy (Universal, EMI, Sony BMG and Warner Bros). Wszyscy najlepiej sprzedający się artyści należą do nich

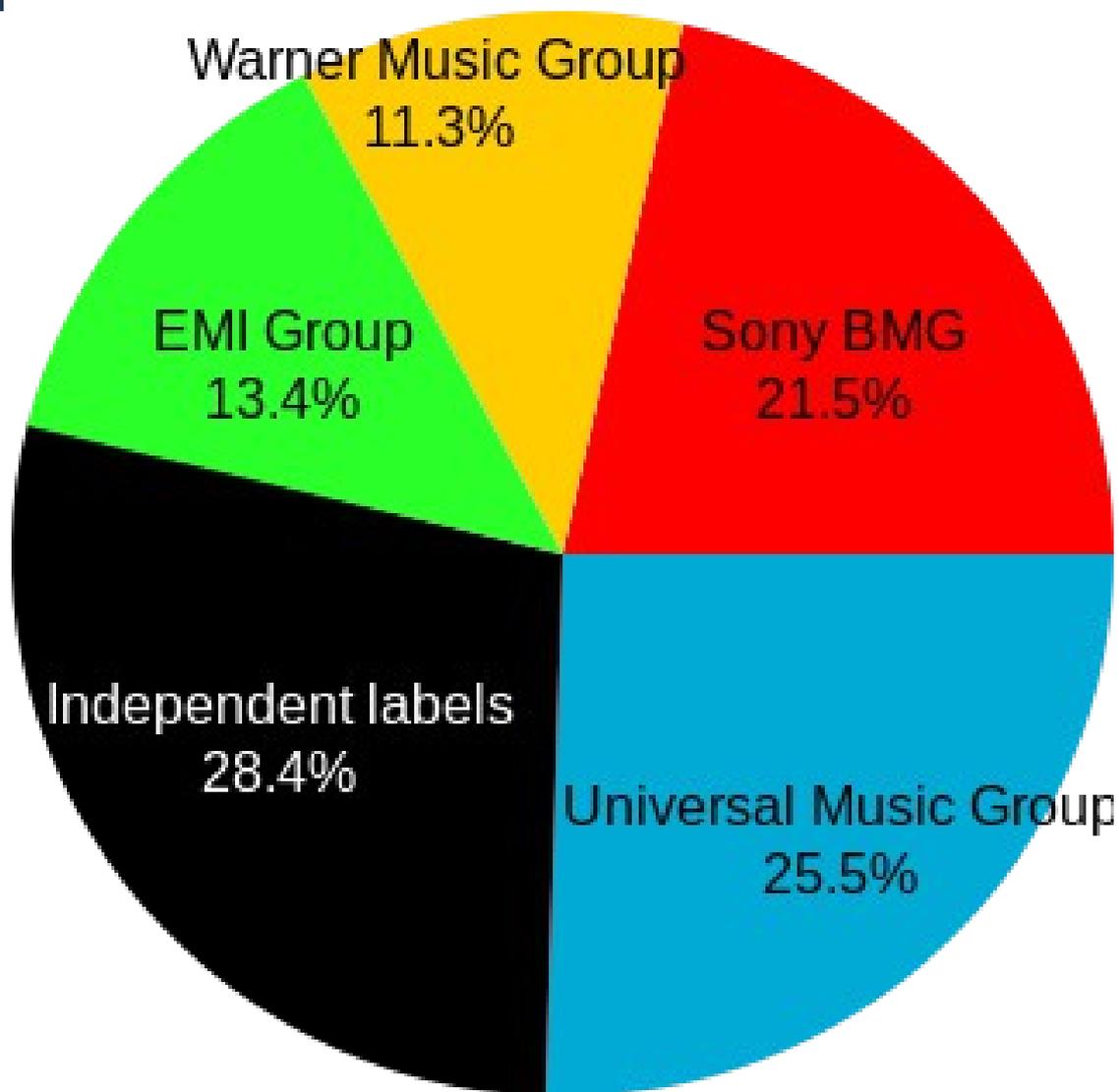


# Introduction to record industry





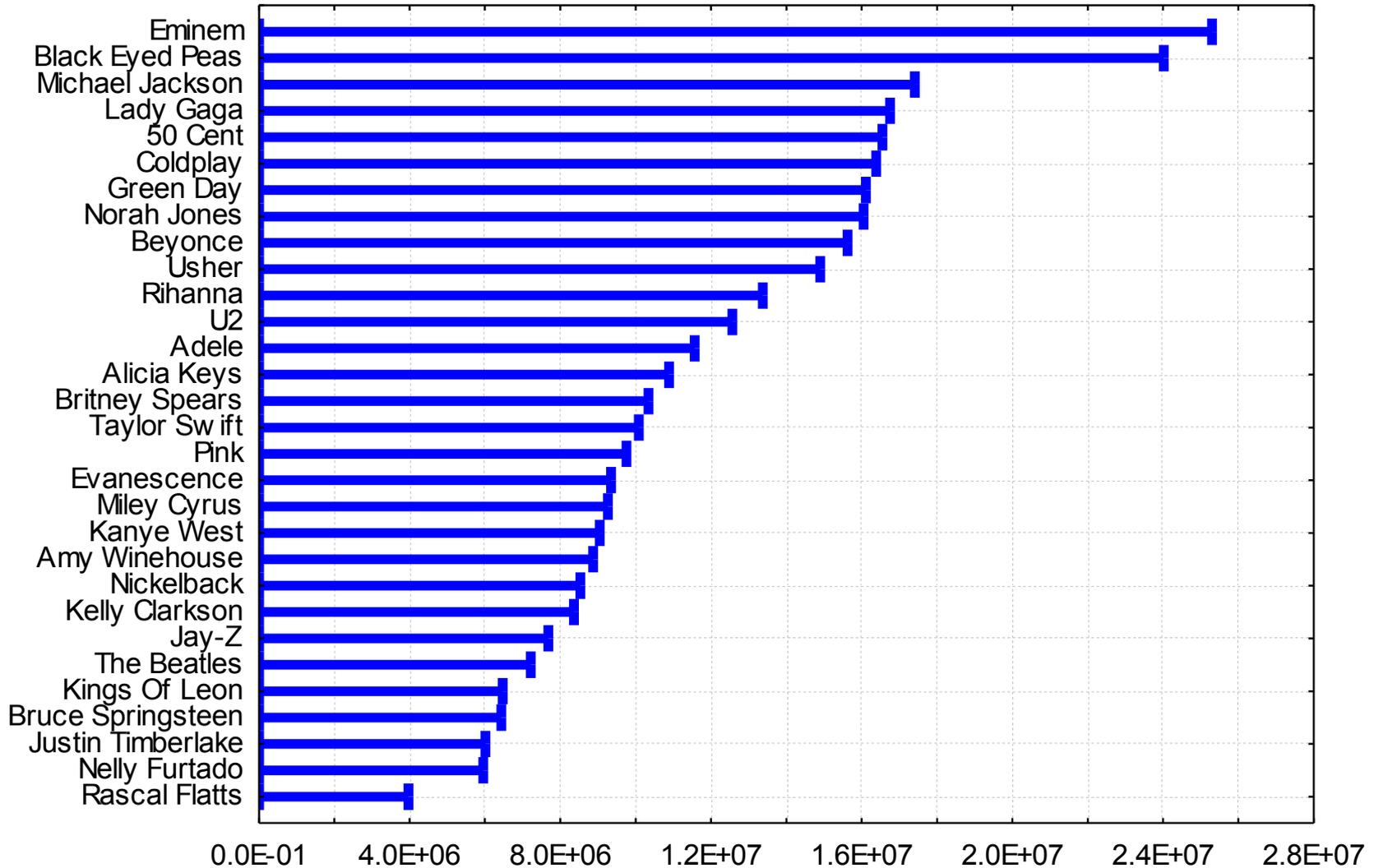
# Introduction to record industry





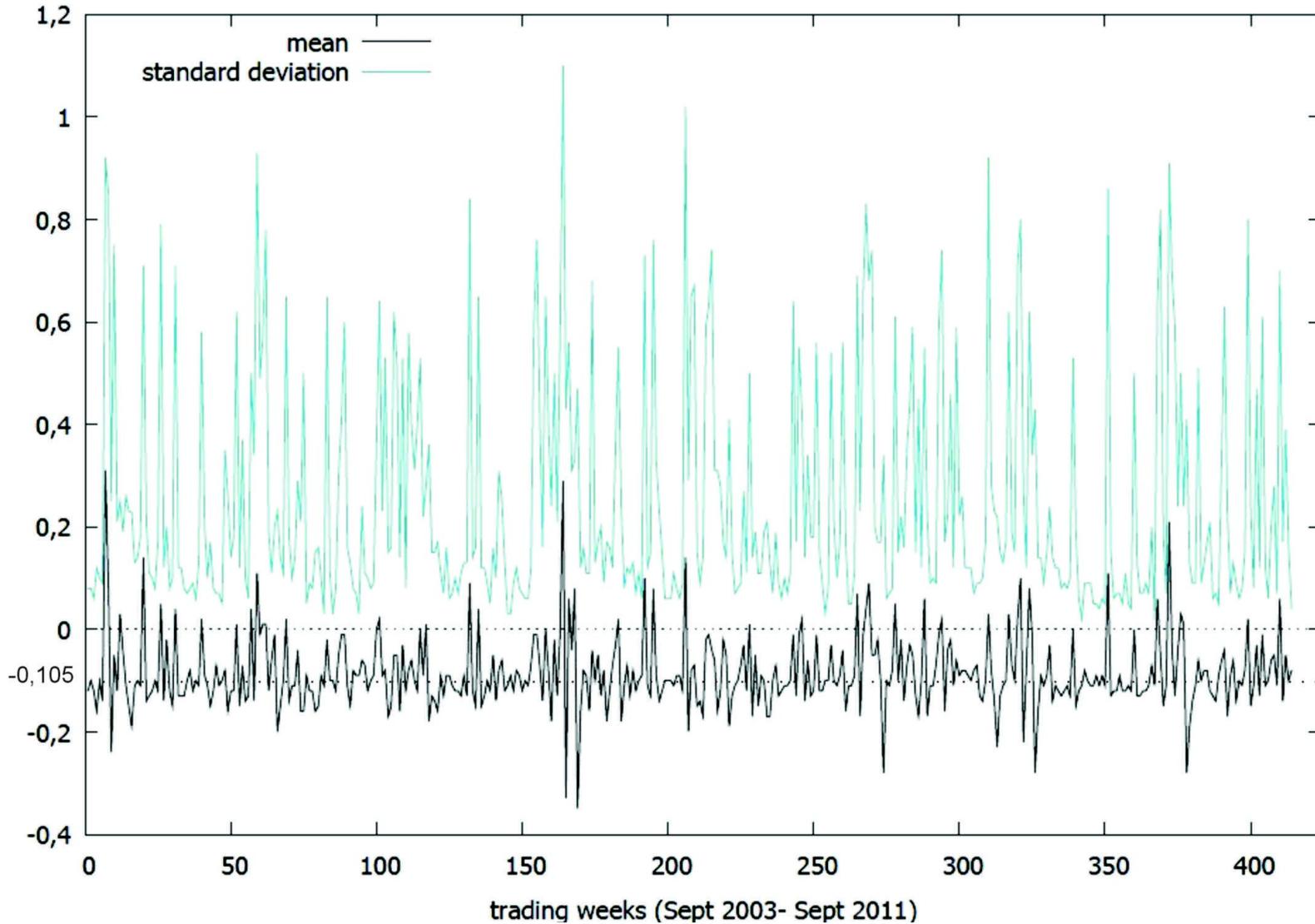
# The most popular artists

30 best selling artists (2003-2011)



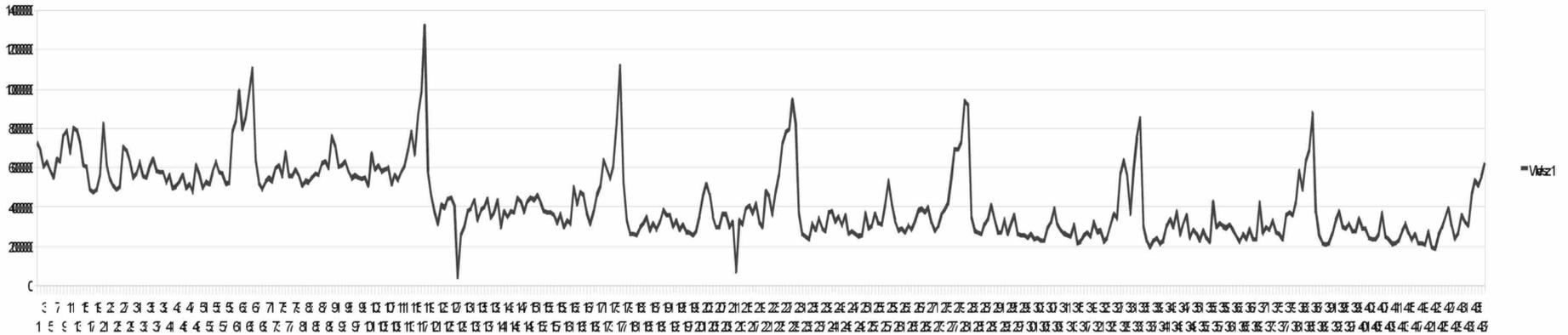


# Logarithmic returns



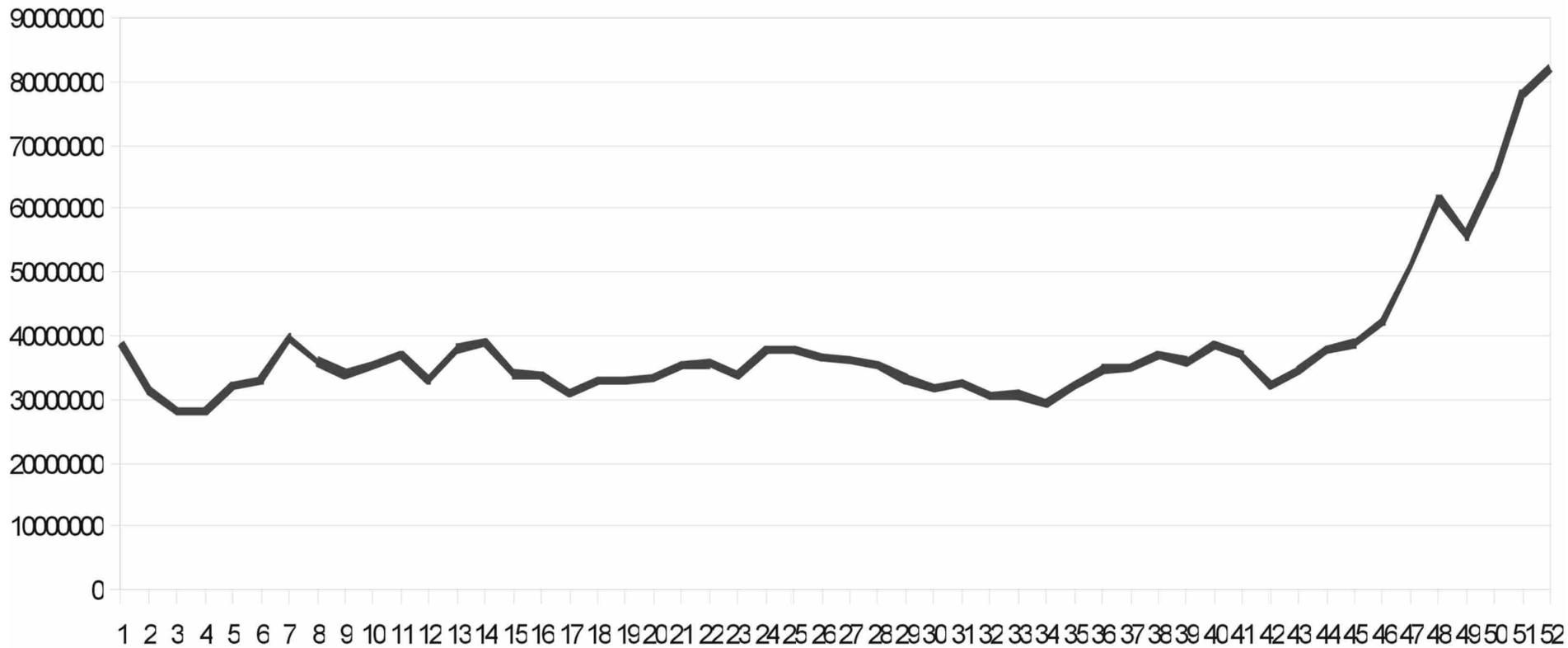


# Record sales seasonality



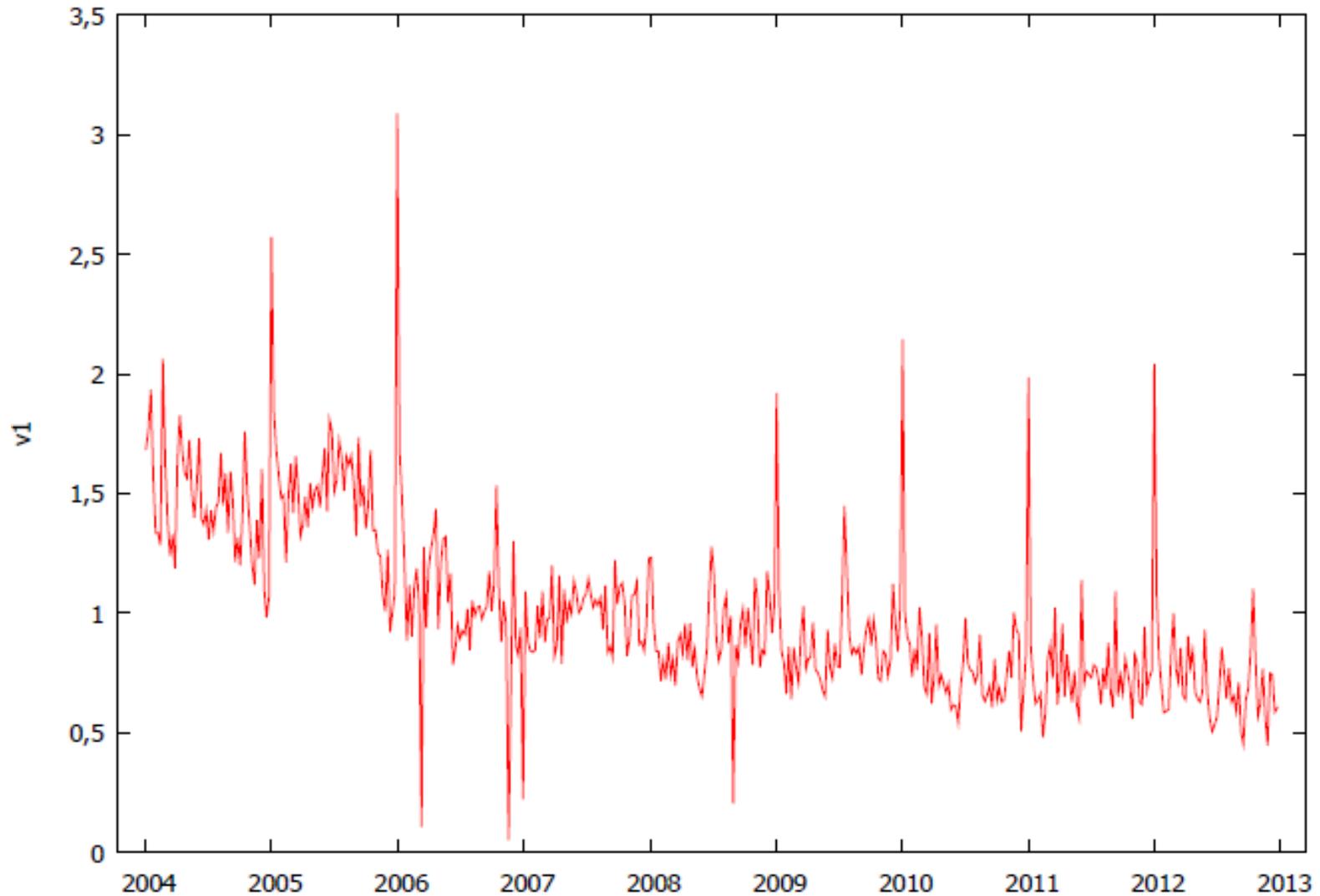


# Mean record sales seasonality



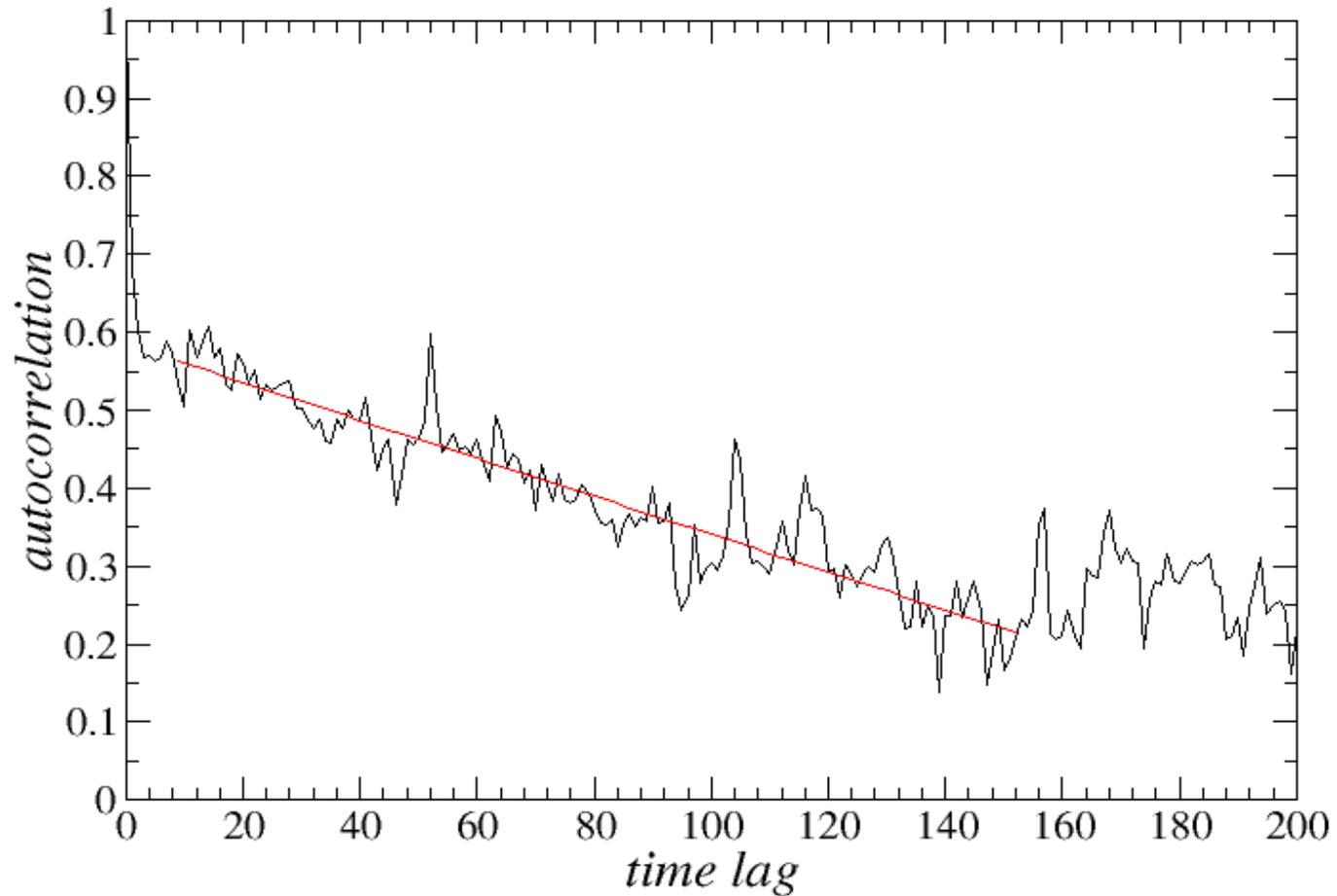


# Detrended record sales



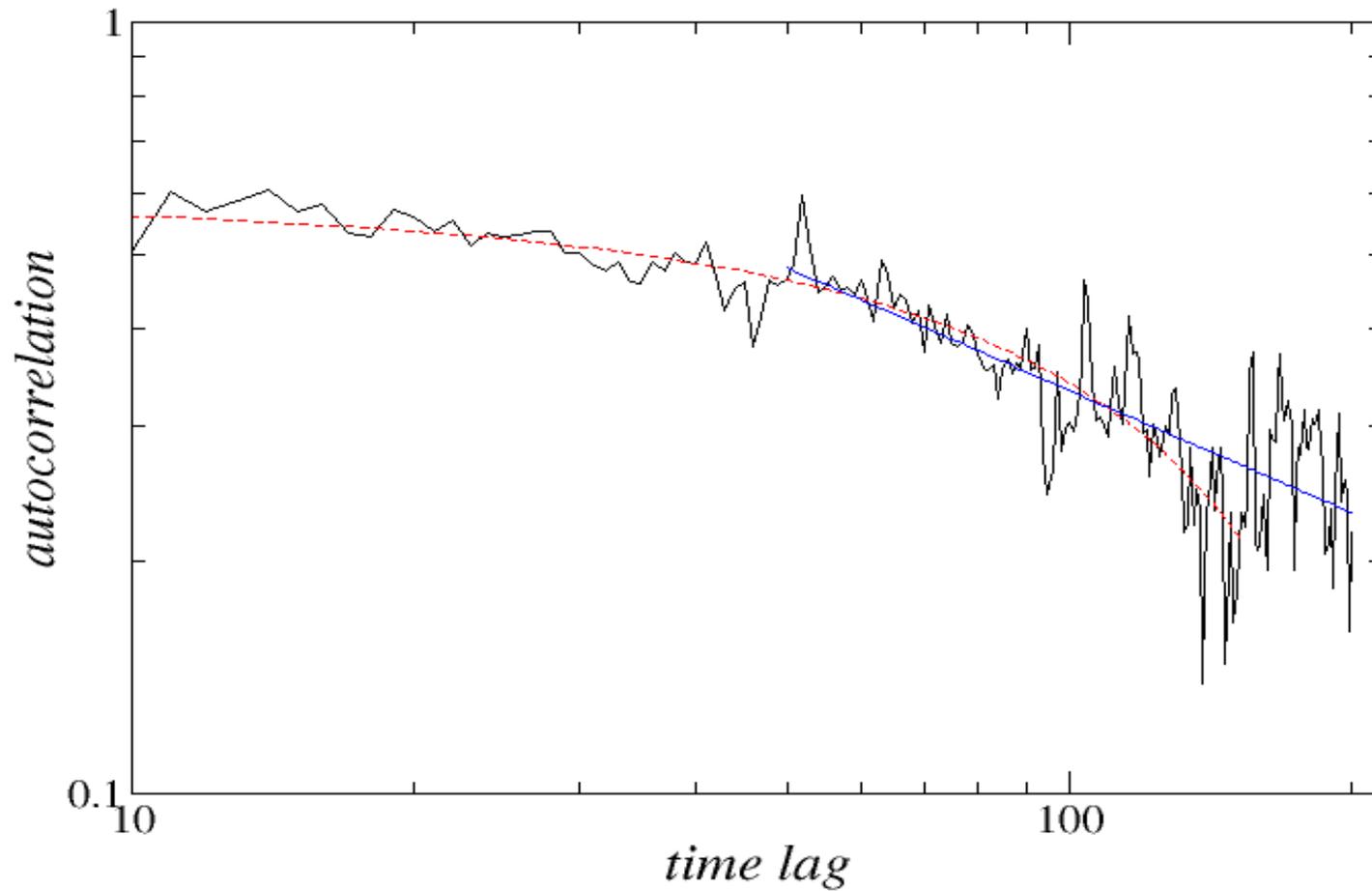


# Autocorrelation





# Autocorrelation





# Hierarchical structure

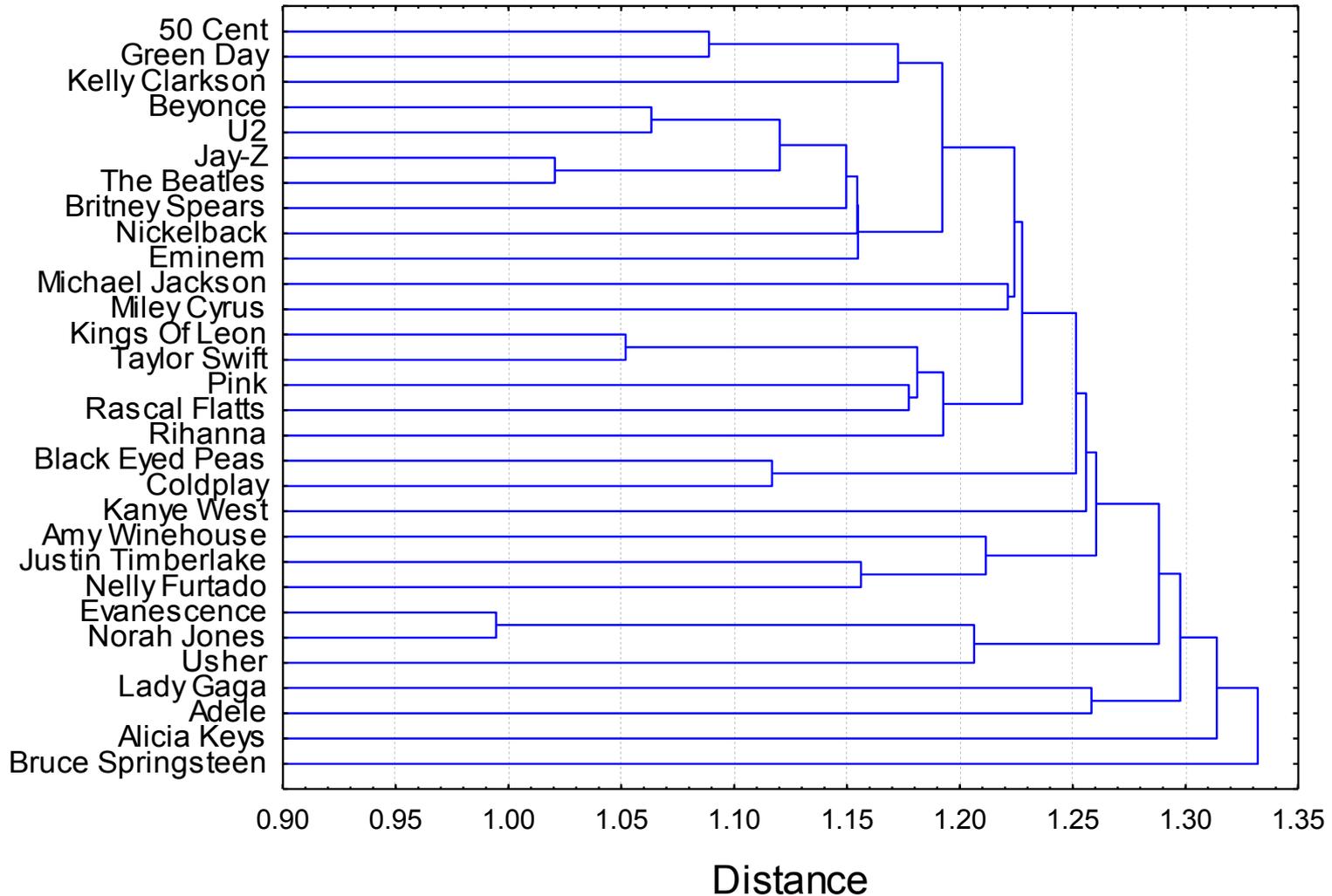


- Pearson's correlation coefficient
- Euclidean metric



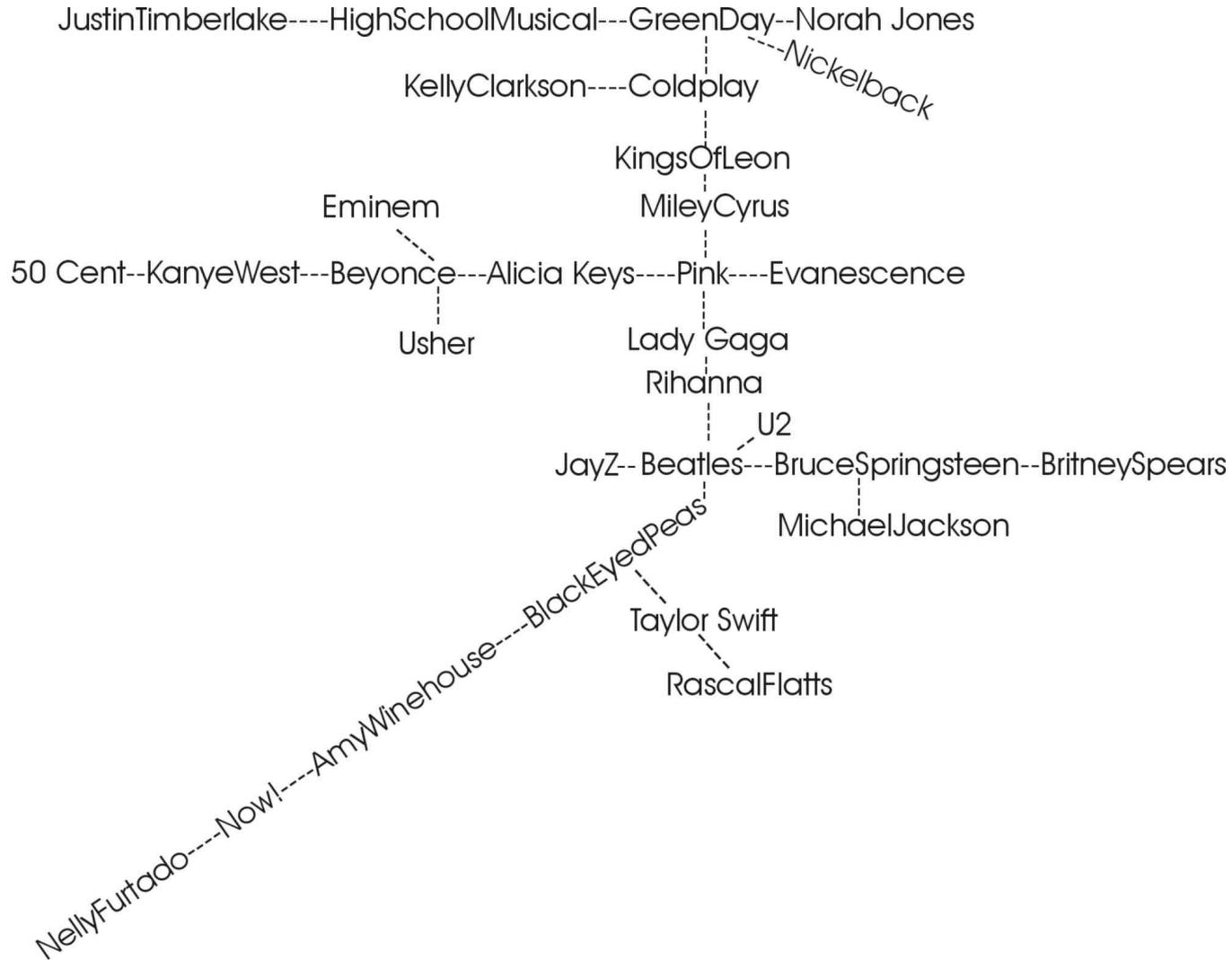
# Hierarchical structure

Diagram of phonographic market



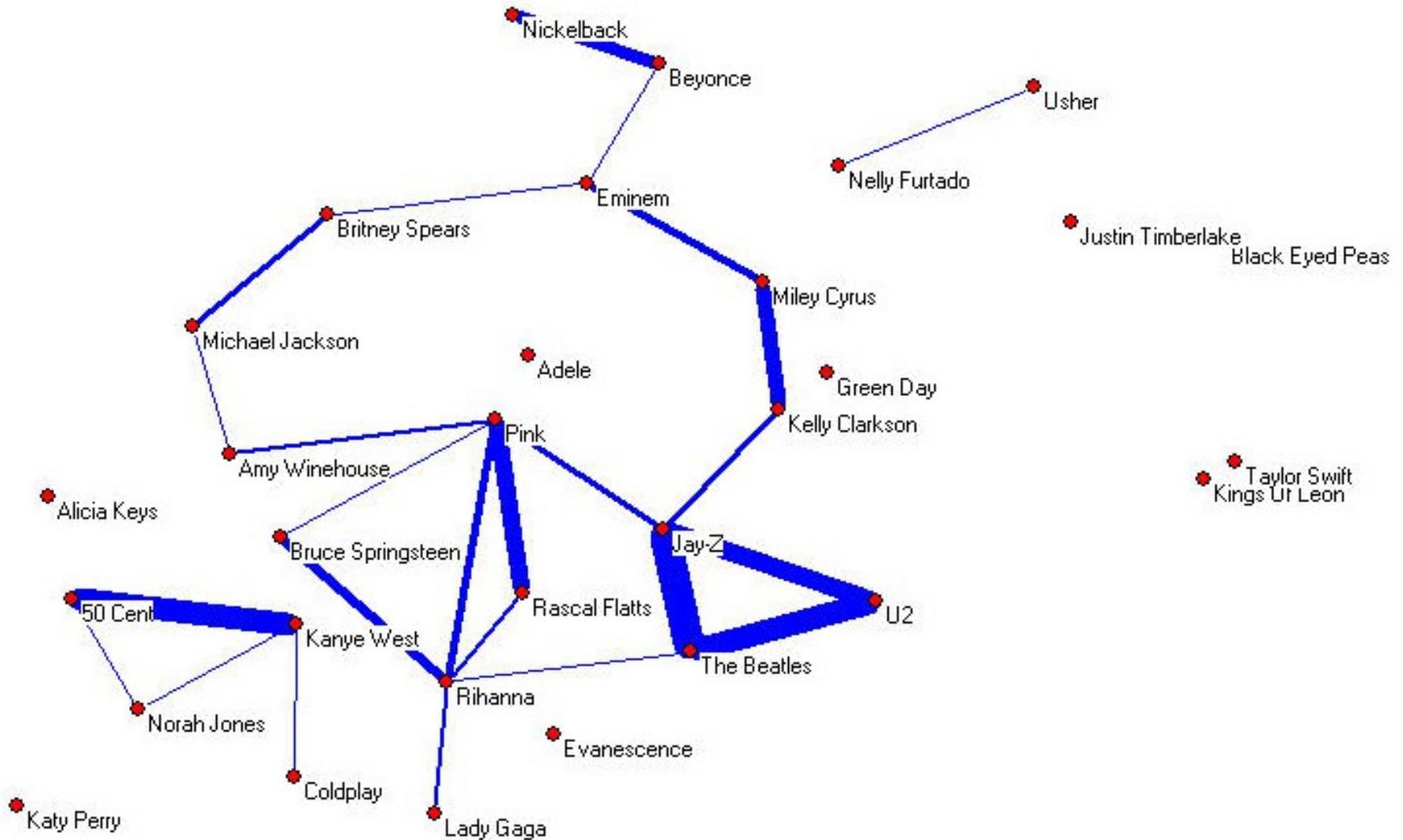


# Hierarchical structure



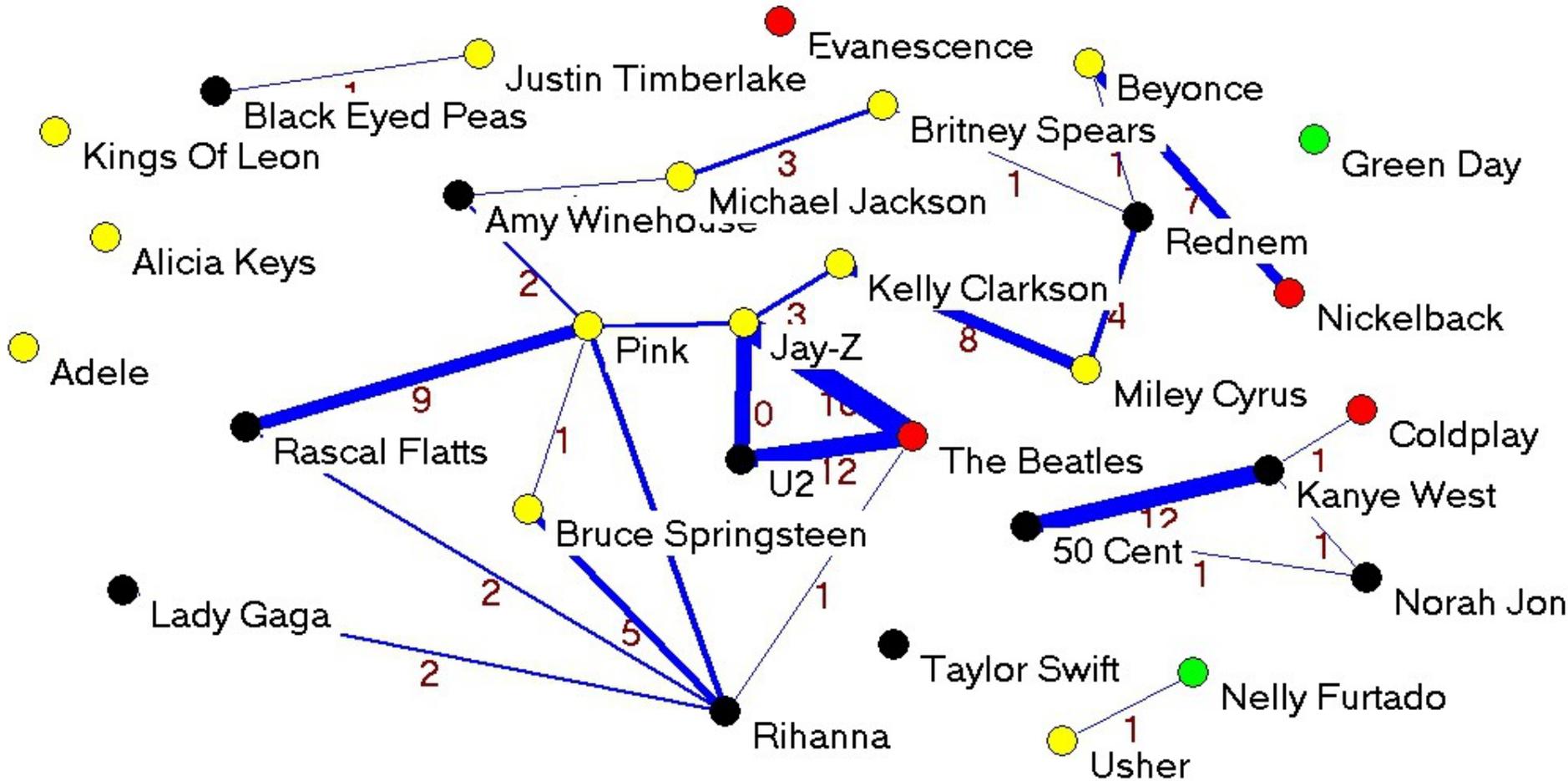


# Hierarchical structure



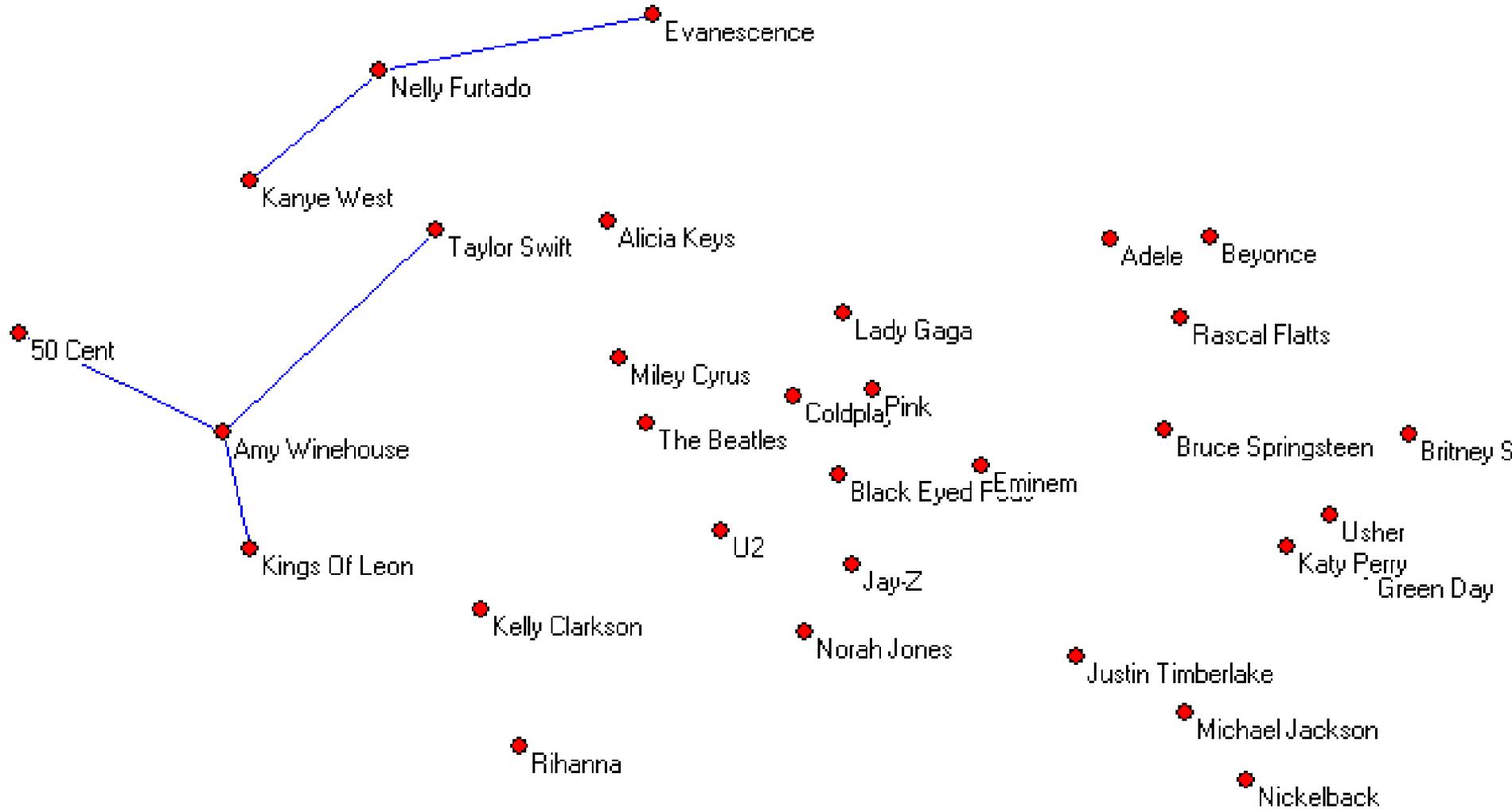


# Hierarchical structure: record labels vs artists





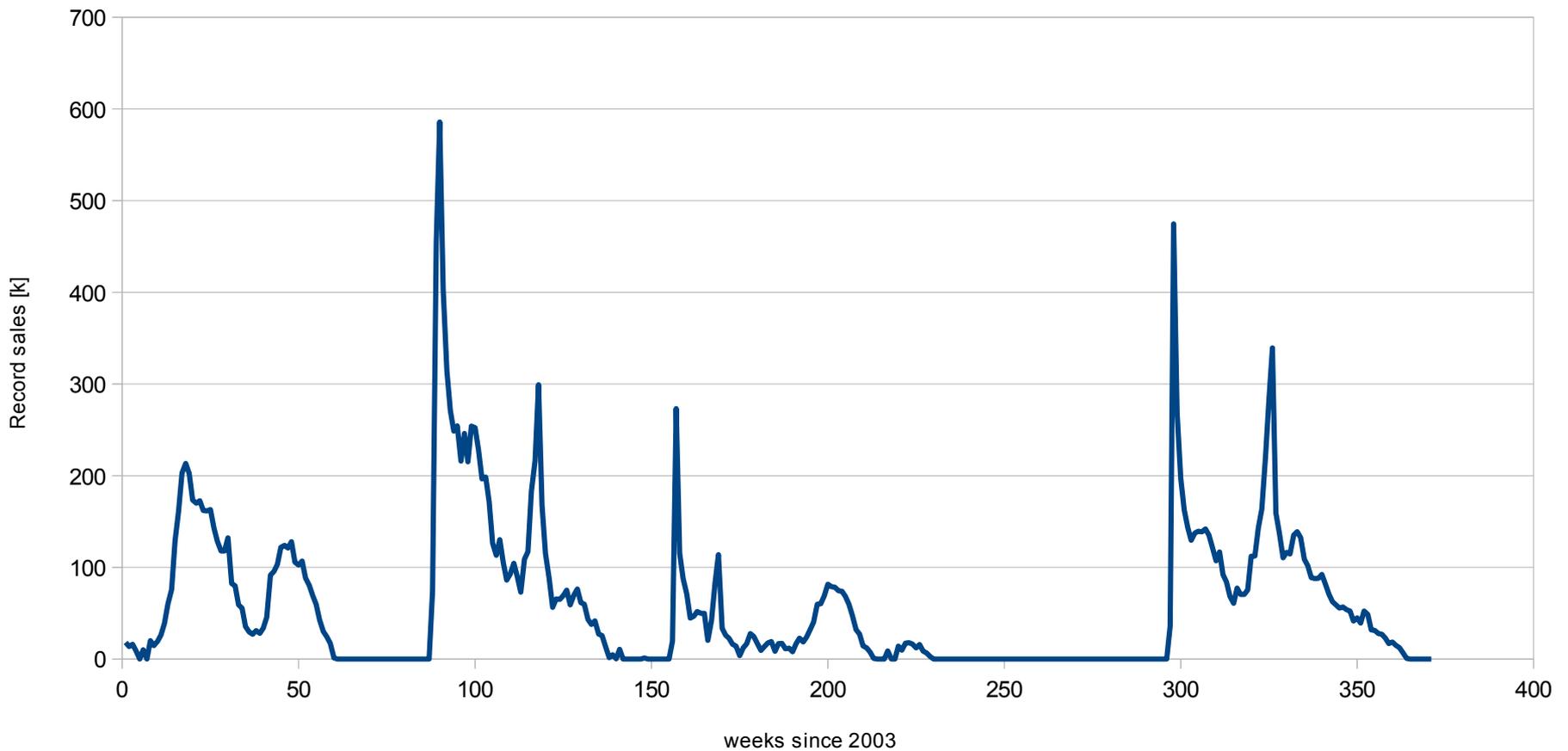
# Hierarchical structure: negative relations





# Individual artist's record sales

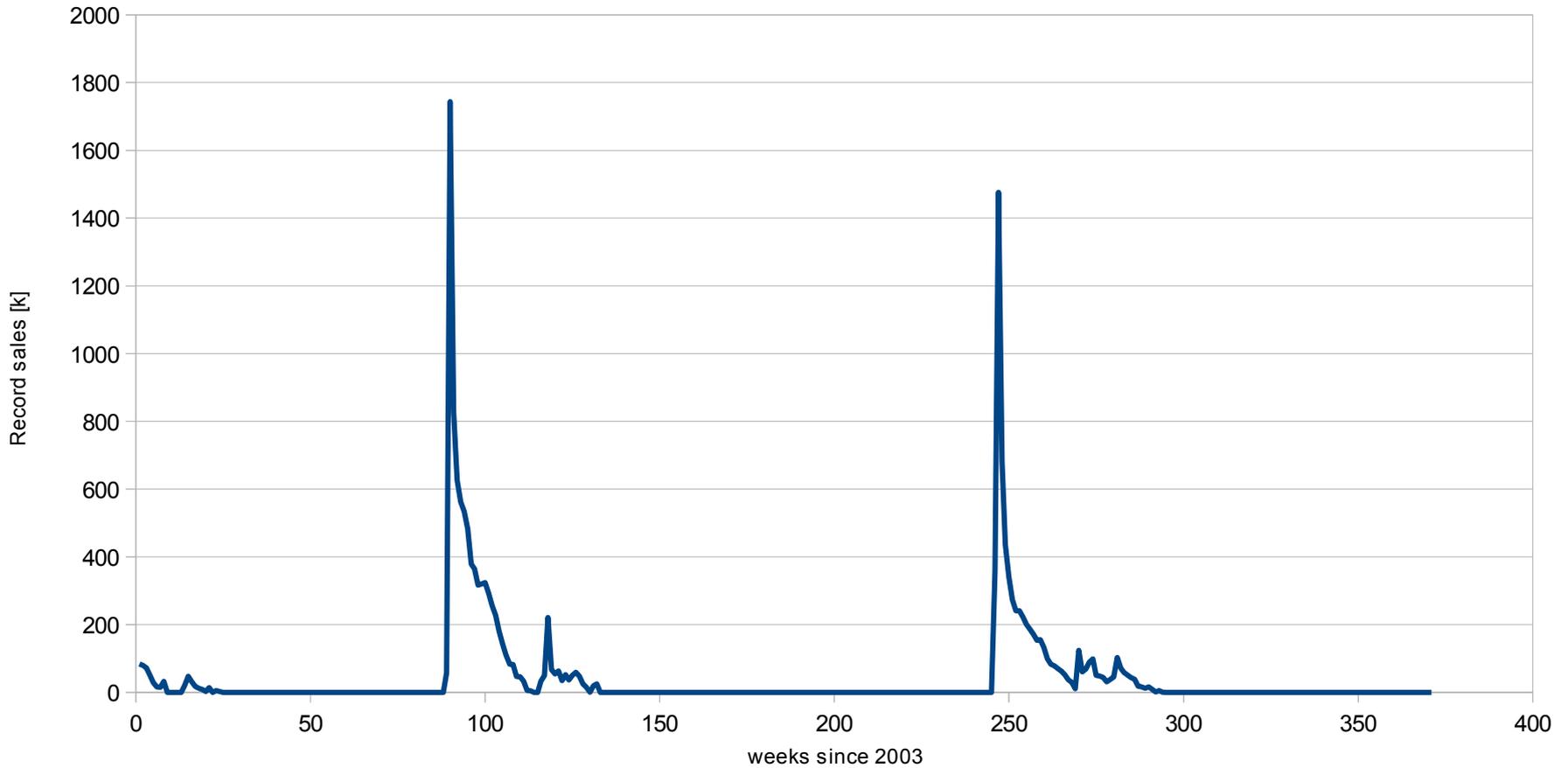
Black Eyed Peas





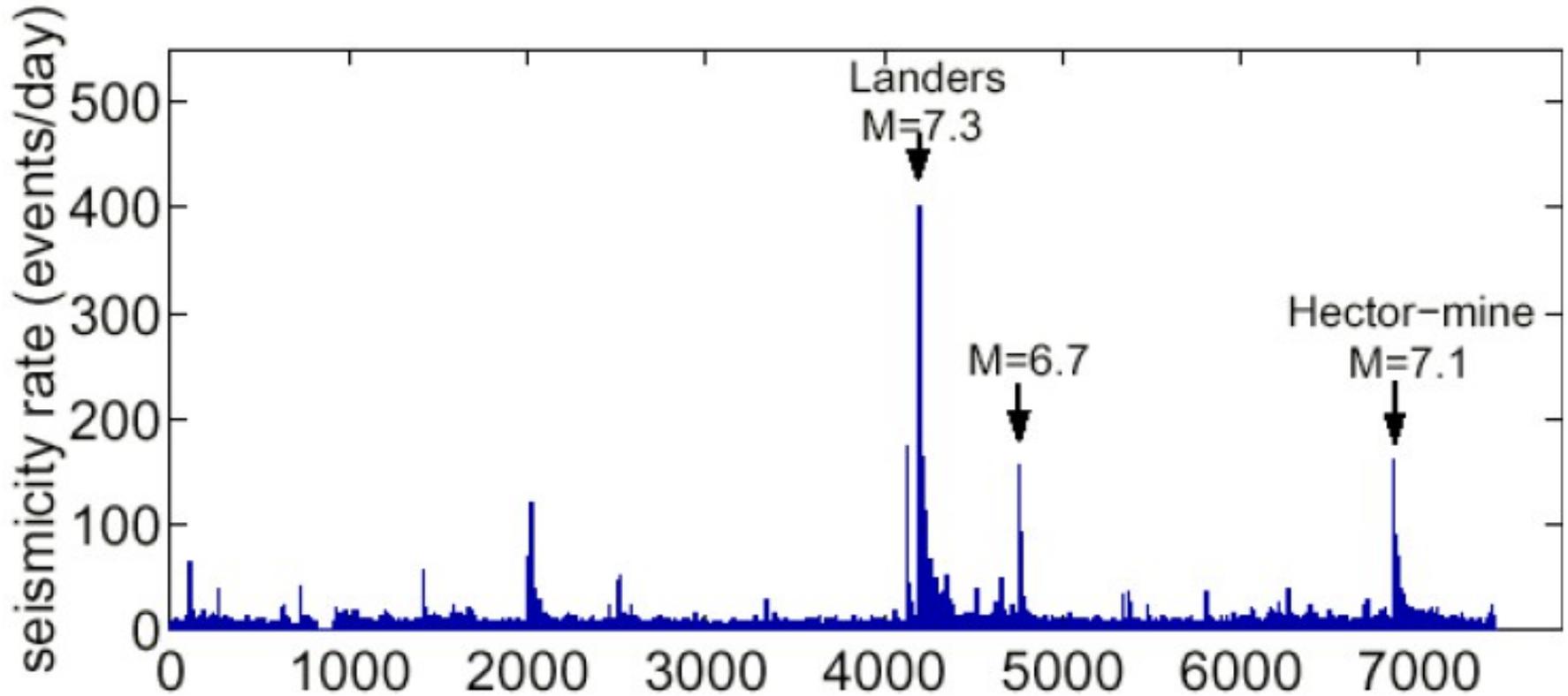
# Individual artist's record sales

Bruce Springsteen





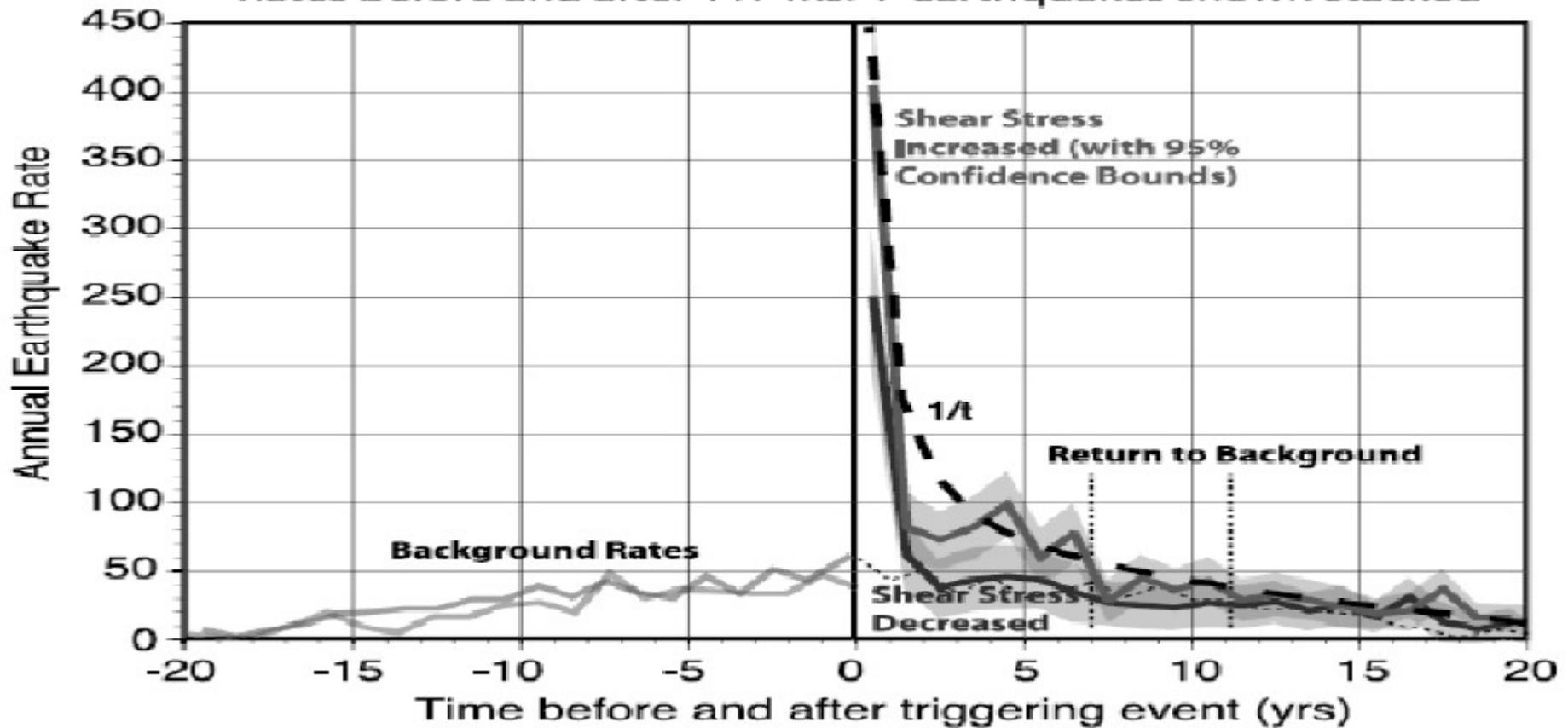
# Similarity to earthquakes





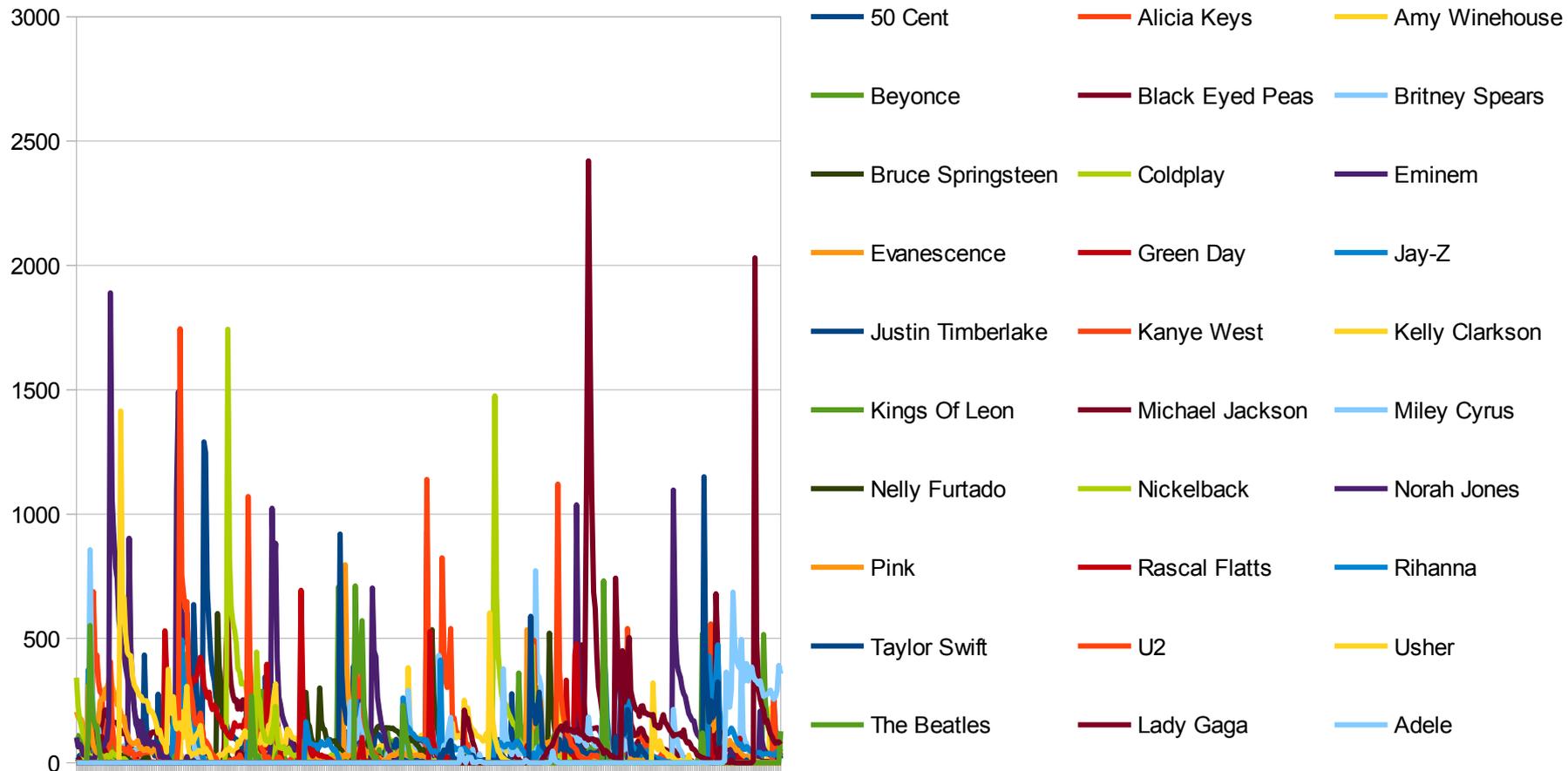
# Similarity to earthquakes

**Harvard CMT Catalog: Triggered Earthquake Rate vs. Time**  
Rates before and after 117 Ms>7 earthquakes shown stacked



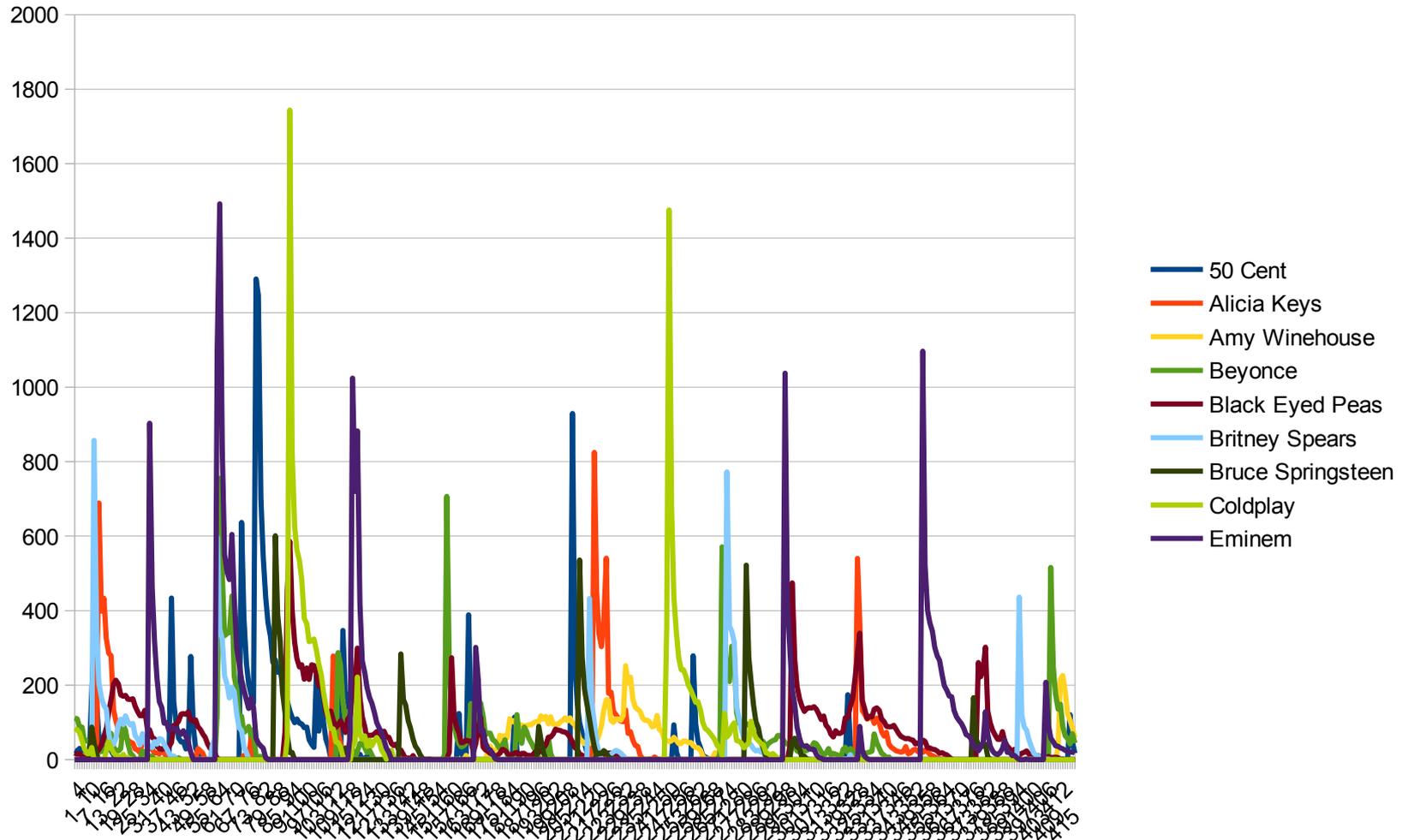


# Artists record sales





# Artists record sales





# Model assumptions

- Consecutive album releases every 120 weeks on average
- Album promotion lasts 40 weeks on average
- Main hit single + 3 additional promotional singles
- Quality effect appears in 1/3 of all album releases

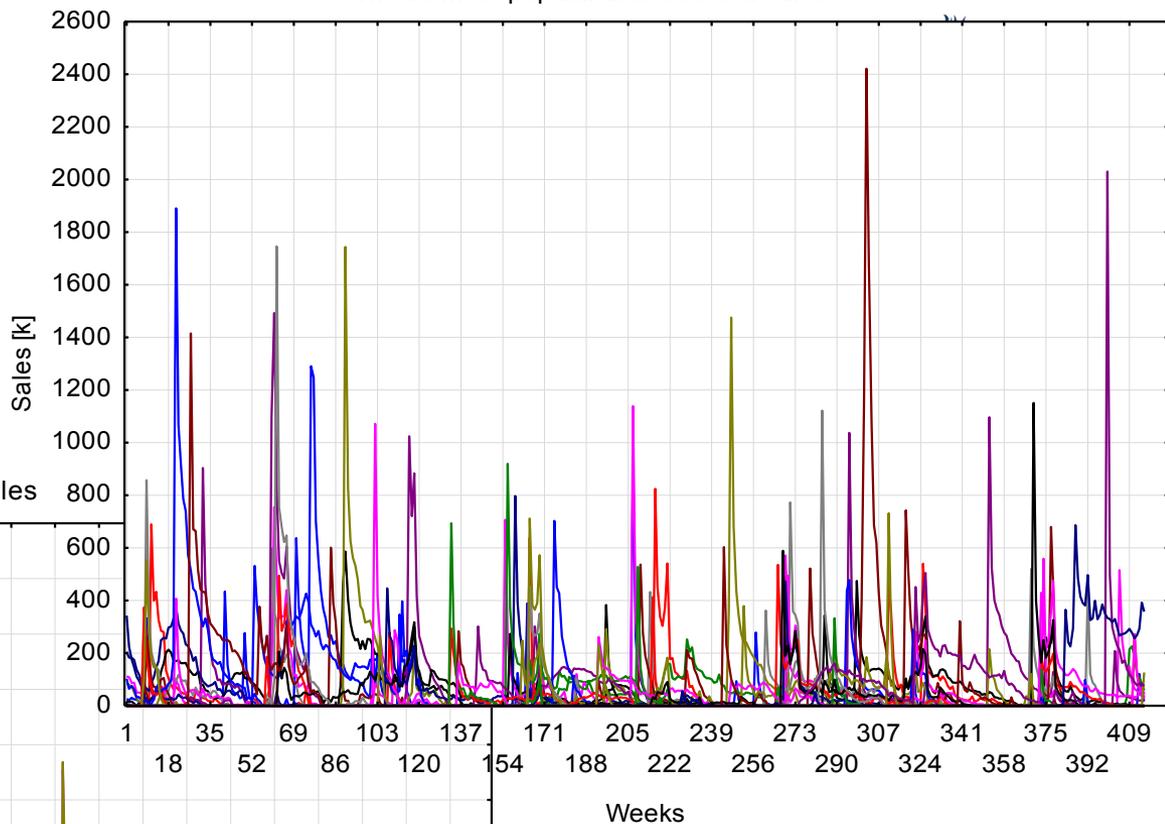


# Record sales stochastic model

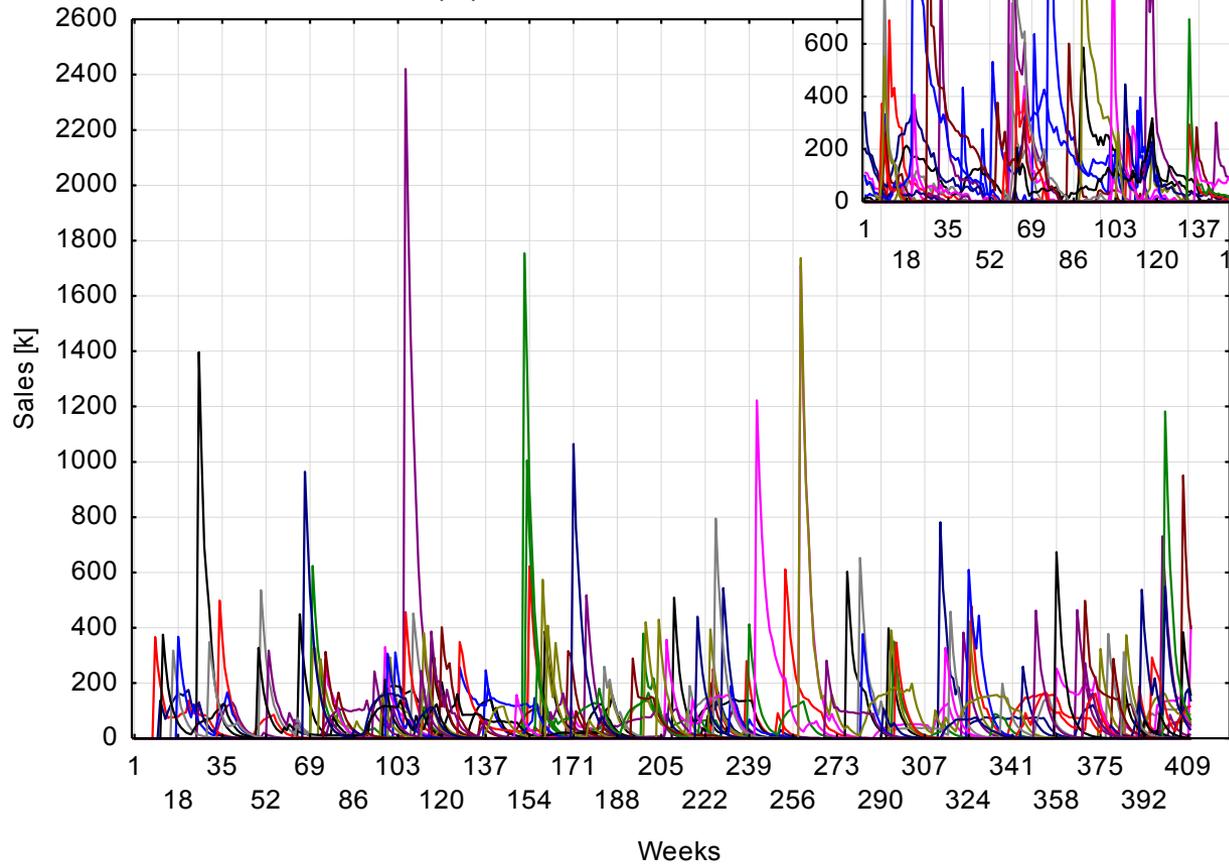
- Base model: Mean Reverting Geometric Brownian Motion (MRGRW)
- Additional state – excited – during album promotion
- In excited state: fundamental peak and aftershocks with high reverting level possibility



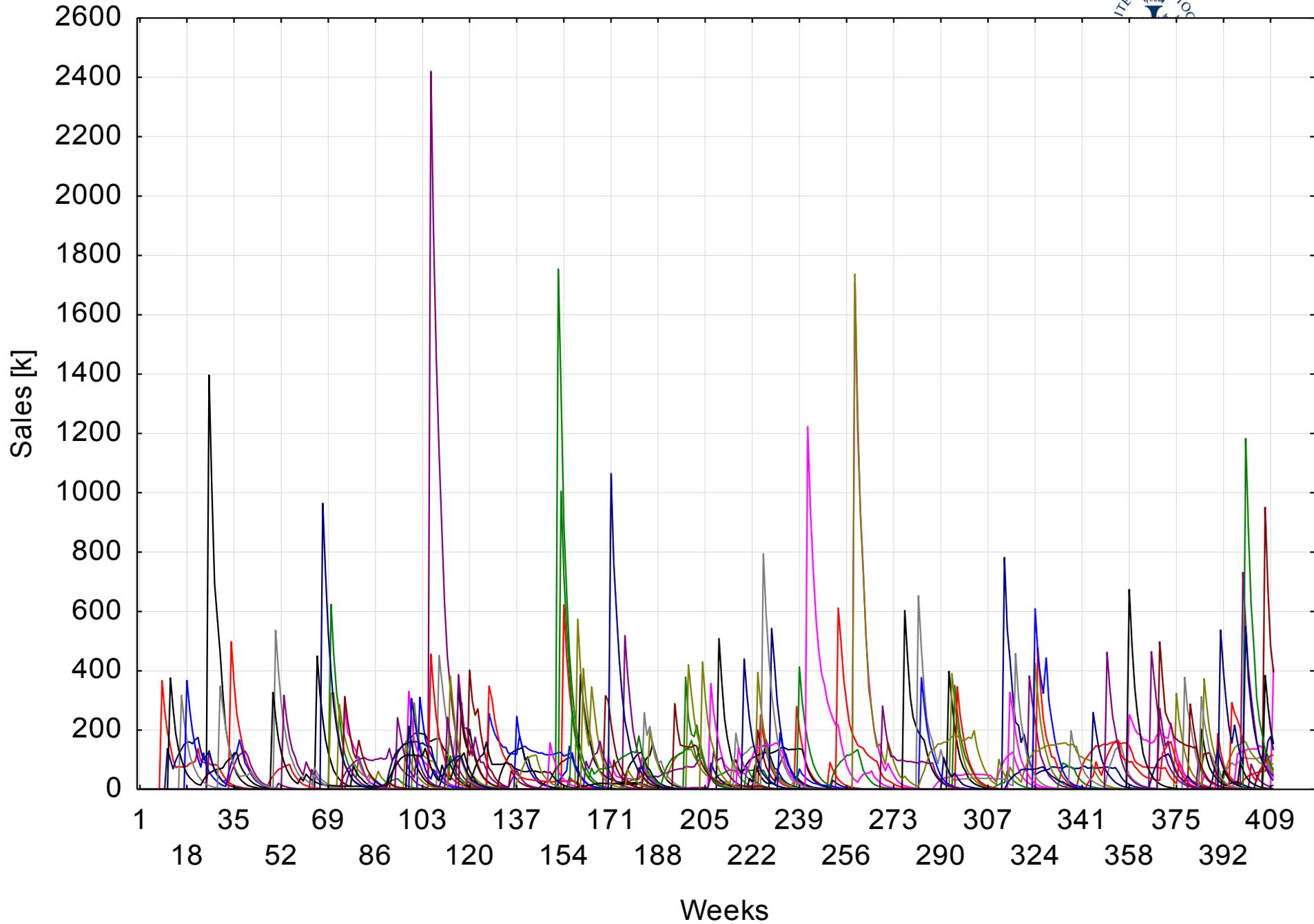
The 30 most popular artists record sales



The MRGRW model of the 30 most popular artists record sales



# The MRGRW model of the 30 most popular artists record sales





# Record sales stochastic model

- Markovian transitions between base and excited states (MRGRW) and vice versa
- Album release (transition to excited state) as a random value from unitary + fat tailed distribution
- The same MRGRW parameters for both base and excited states
- Promotional hit-single release (in excited state) as a random value from from unitary distribution
- High sales plateau as an effect of record quality (additional increase of reverting level)



## Record sales stochastic model - disadvantages

- To many fitted and heuristic parameters (based on empirical expert's knowledge)
- Short time series (400-500)

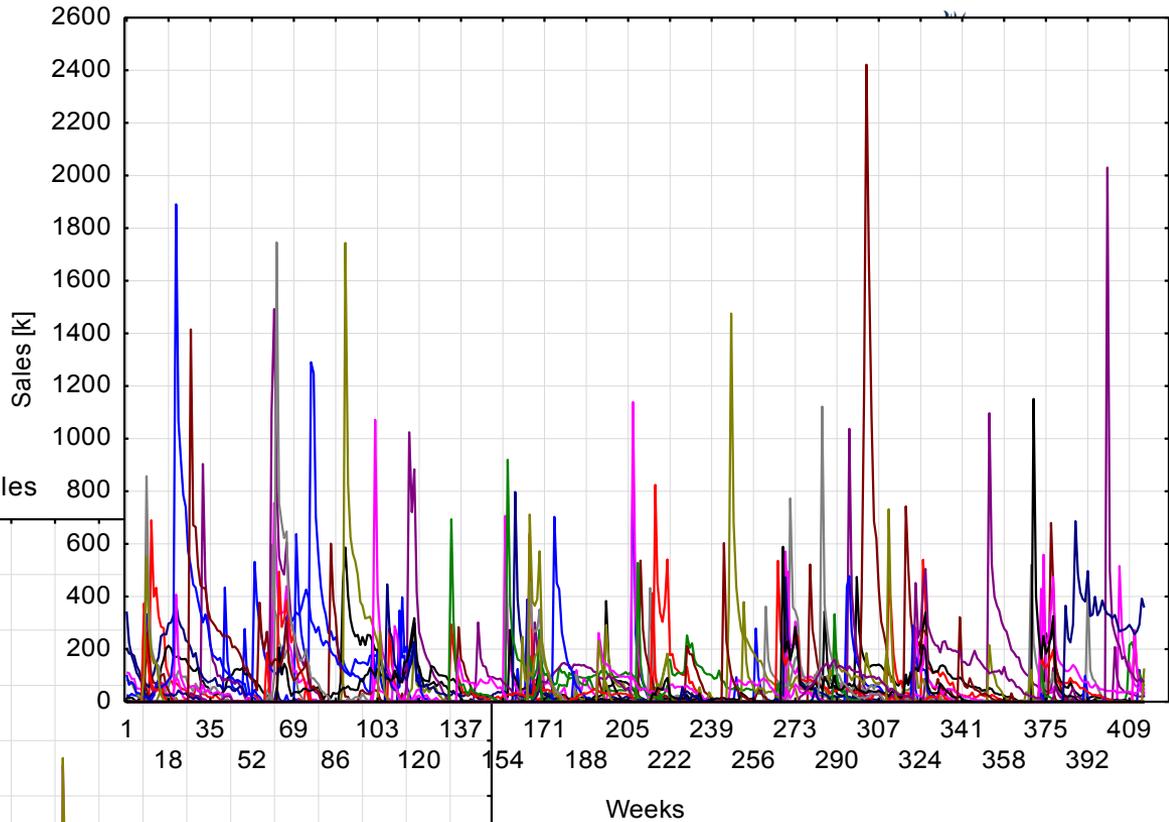


## Future works

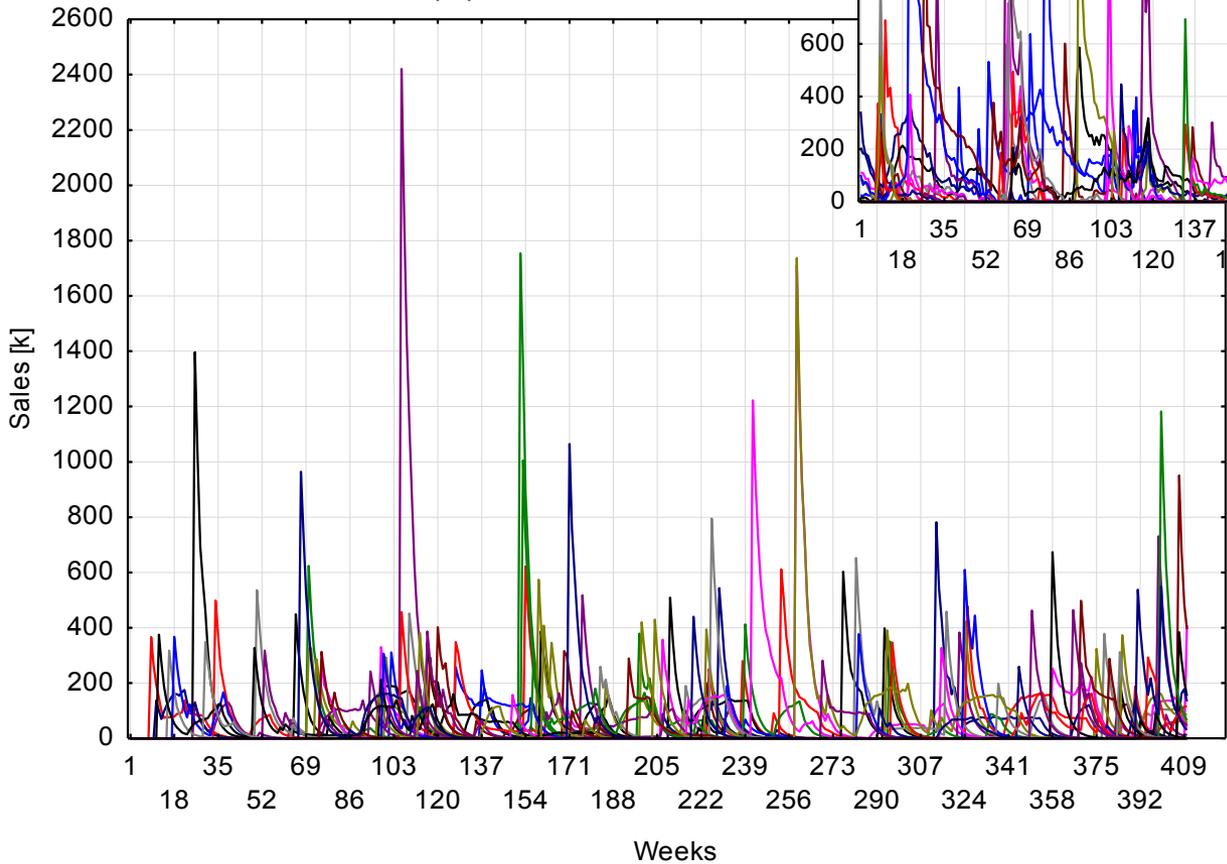
- How to set album release date to obtain best possible record sales?
- Collective effects
- Sales peaks predictions



The 30 most popular artists record sales



The MRGRW model of the 30 most popular artists record sales



**Thank you for  
your  
attentions**