Financial network analysis using SWIFT and R

mr.sc.ee. Krešimir Kalafatić
kresimir.kalafatic@gmail.com
(joint work of Krešimir Kalafatić and Marijana Buždon)

30.05.2015, Chicago,IL
General overview

- What is SWIFT?
  - SWIFT is software platform for exchanging standardized financial messages between banks, financial institutions and corporations
  - more than ten of thousands of banks, financial institutions and corporations, in more than 200 countries use SWIFT platform for exchanging millions of financial messages daily – www.swift.com

- Project idea:
  - build the infrastructure for international statistical analysis how joining the country to EU affects its financial system and economy from a perspective of one large bank
    (Croatia joined the EU on 1 July 2013, neighboring countries are in the process of negotiation and experience from Croatia can be used for their integration in EU)

- Why use SWIFT data:
  - SWIFT is used in cross-border transactions, HSVP (RTGS in Croatia), TARGET2 (European Monetary Union RTGS), TARGET2-Securities, uses international standardized message format, ....

- Why financial network analysis:
  - financial networks are probably the next step in evolution of risk management and accounting standards
System design

- SWIFT production system
  - SWIFT Alliance Access server – central point of SWIFT application

- our system for statistical analysis:
  - 1 RHEL server for production
    - NoSQL database
    - parser for SWIFT MT format
    - R version 3.1
      - data import
      - data analysis
      - HTML report generation using **knitr**
      - for visualization we are using **rCharts**
      - financial network analysis
        - used R libraries: **igraph, sna, network, ...**
      - web browser graphical representation – our own javascript using d3.js and data generated in R with custom options of filtering, zoom-in, zoom-out, selection by country, drill-down options to HTML reports generated by knitr,....
Credit transfer network

- credit (wire) transfer network is for economy as coronary angiogram for heart blood vessels
- several factors have to be taken into account:
  - network structure and behavioural change between ordering and beneficiary customer
  - network structure and behavioural change between the banks
    (change in regulation and monetary policy, bank consolidation and contracts,...)
- interbank wire transfer network analysis:
  - network metrics used for statistical analysis and conclusions
    • e.g. closeness centrality of interbank wire transfers with EEA countries in periods before joining EU, after joining EU and after joining SEPA
  - graphical analysis of financial network
Cross-border interbank credit transfer network before joining EU
Cross-border interbank credit transfer network after joining EU
Cross-border interbank credit transfer network after joining EU and SEPA
Project results

- System was till now used for:
  - reporting to internal business users
  - performing analysis for regulatory requirements
  - financial network analysis
    (wire transfers, operational risk management, interbank communities,...)

- The infrastructure is simple to implement, requires low maintenance and can be used in countries and banks with small and limited IT budgets

- The infrastructure can also be used in following fields:
  - double checking of the internal computer systems
  - auditing of SWIFT traffic
  - various statistical research

Business contacts:  
kresimir.kalafatic@pbz.hr
marijana.buzdon@pbz.hr