Are specific topics driving asset prices?

WU - QFin Industry Lab Kick-Off

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Project Team

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Education

- Mag. rer. soc. oec in Economics, University of Innsbruck, Finance and Capital Markets
- Master of Business Administration in Corporate Strategy International Business, Danube University Krems

Work Experience

- PwC: Director, Financial Services Risk & Regulation
- BAWAG P.S.K.: various Managing Positions in Treasury / Capital Markets and Risk
- Court Expert Witness on Derivative Instruments at the Commercial Court of Vienna

Work Focus

- Advising banks and project management in the area of strategic risk
  - SME & project lead EBA stress test (leadership for Austria and the international banking group)
  - Analysis and design of Target Operating Models and ICAAP/ internal stress testing framework
  - IFRS9 PD modeling and FLI integration, risk provision planning in COVID-19 context
  - Derivative products based workout & litigation expert support

- Advising banks with respect to market and credit risk
  - Validation and model improvement of credit risk models
  - Support for the supervisory review process by OeNB, FMA and ECB
  - Development & implementation of synthetic structured credit pricing models for CDO, CDO², CPDO, CPPI products
  - Market risk based modelling (e.g. Credit Spread risk based on parametric & historical Value at Risk)

- Responsible for valuation, pricing & issuance
  - Design and pricing of tax-optimized, (partially) capital-guaranteed (…) payout profiles based on hedge fund portfolios for institutional clients
  - Modeling and securitization of hedge fund portfolios as Collateralized Fund Obligation (“CFO”)
  - Management of index certificates and participation certificate issuing program

- PwC expert for interbank offered rates (IBOR)

Florian Moemken, M.Sc.

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Education

- Quantitative Finance, Vienna University of Economics and Business, M.Sc.
- Business Administration, University of Ausgburg, B.Sc.

Work experience

- PwC: Associate, Financial Services Risk & Regulation
- KPMG: Financial Services
- Tecta Invest GmbH: Portfolio Management Fixed Income
- Flessa Bank: Risk Controlling and Treasury

Work Focus

- ECB/EBA Stress Test
  - Advanced analysis, preparation and processing of risk and accounting data
  - Methodological support of the credit risk stream
  - Workshops about implementation of regulatory requirements in credit risk stream
  - Data quality assurance (i.a. measurement of KPIs in credit risk)

- Advising banks with respect to new regulatory requirements
  - SA-CCR (counterparty credit risk)
  - Support in creation of internal methodology for settlement and issuer risk of various derivatives and implementation in Murex

- Modeling in the area of credit and market risk
  - Modeling of the probability of early loan repayments
  - Development of an FX hedging tool to visualize and minimize foreign currency risk
  - Distribution fitting for insurance data on loss occurrence probabilities and loss amounts
  - Agent Based Modeling for future demand development of an Austrian medium-sized company

- Anti Financial Crime: AML – Transaction Monitoring, KYC

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Project Overview

Are specific topics driving asset prices?
Fundamental themes which influence prices across asset classes

Research hypothesis:
Through time there are unique structural themes which influence/ determine price movements across multiple asset classes.
Identification of such themes improves

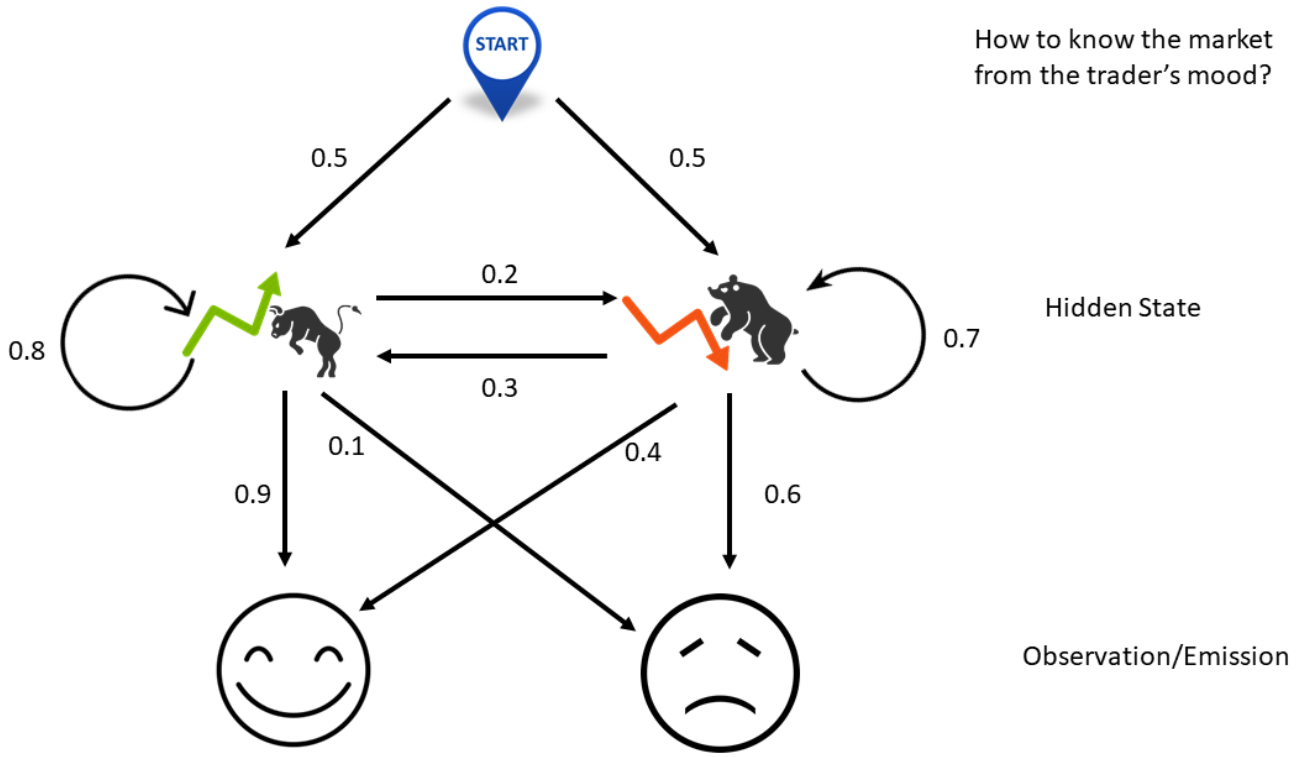
- assessment of persistence and
- impending regime changes/ structural breaks, as well as
- accompanying correlation & volatility regime changes

in and between asset classes.

Example:
During most of 2009 through 2010 the driving theme governing asset movements was the “Sovereign Debt Crisis”. Interest Rates, FX movements and Stock Markets around the globe waxed and waned with EU Sovereign default fears.

An Index made up of the credit spreads of the **PIIGS countries** represented this theme very well and enabled **analysis of the phase out and beginning of a new dominant topic in real-time**.

General Idea:
Dimension Reduction & Identification of “hidden” States/ Key Driving Topics



Source: Letian Wang Blog on Quant Trading and Portfolio Management

Are specific topics driving asset prices?
Analyze concentration risk and improve preparedness

Hidden Markov model

- Observable process (development of asset prices)
- Outcome of observable process influenced by hidden / unobserved common driver(s)
- Learn about drivers by analyzing asset prices

➢ In-depth analysis of different time series for **various asset classes** and time horizons in order to **identify underlying common drivers**

Examination of common topics / drivers and development of correlations between asset classes is one of the keys to understanding concentration risk.

Application of suitable statistical methods

From a macroeconomic perspective suitable mathematical tools could be…

…Principal Component Analysis (PCA)

➢ Analyze time series in sections (e.g. year by year) using PCA and examine how the components / explanatory power changes over time.

…**Kaiser-Meyer-Olkin Test**

➢ Determine proper sample adequacy

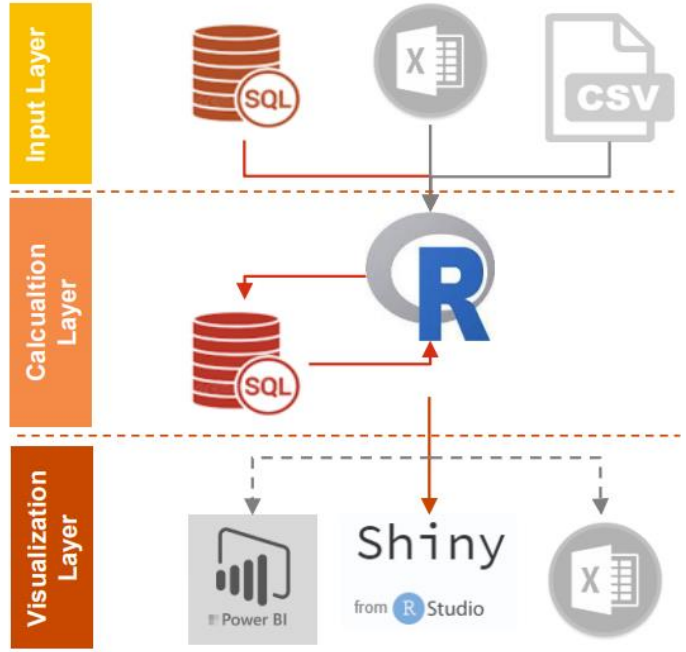
…Bayesian (Neural) Networks

➢ probabilistic graphical model that represents a set of random variables and their conditional dependencies via a directed acyclic graph.

…etc.

Microeconomic analysis:
include company specific information, e.g. Fama and French factors (high minus low, small minus big).

IT-Stack – Structure of the „expert"-system



Are specific topics driving asset prices?
Fundamental themes which influence prices across asset classes

The research problem can be divided into the following **three steps:**
(1) Data Preparation & Brainstorming
(2) Statistical analysis & macro-economic interpretation
(3) Visualization & Next Steps

High Level Roadmap (Part 1)

I. Data Preparation & Brainstorming

1. Data Preparation

a. Define theoretically suitable Data

Economic and Capital Markets related time series across all asset classes, especially Factor-based Time-Series

b. Identify Data Sources

Bloomberg, Yahoo Finance, Kenneth R. French Library on Stock Return Factors, etc.

c. Data Preparation & Quality Assurance

2. Statistical Methods Brainstorming

Pro & Contra of e.g. Hidden Markov-Chains, Principal Component Analysis, Bayesian Nets, Neural Nets, etc.

Devise Long-List and most promising short list of suitable methods

High Level Roadmap (Part 2)

II. Statistical Analysis & Macro-economic Interpretation

a. Application of short-listed models to data, identify issues & solutions and come up with macro-economic interpretation of results

b. Time-Series Regression of Principal Components onto macro-economic/ Factor-Portfolios

III. Visualization of Theme Evolution through time

Outcome

- Fully integrated R Code (Data Input, Data Quality Checks, Statistical Analysis, Output)
- Sensitivity Assessment: Which asset classes are more heavily influenced by the identified topics, which are defensive safe havens?
- Interactive visualization dashboard / web application (e.g. R Shiny, Power BI) of “Driving Topics” through time (incl. conditional correlations)

Data

Bloomberg

yahoo! finance

FRED ECONOMIC DATA | ST. LOUIS FED

Kenneth R. French Data Library

Moody’s INVESTORS SERVICE

REFINITIV

Tools

RStudio

python

TensorFlow

Power BI

Shiny by RStudio

SQL

Are specific topics driving asset prices?
Impulse providing Research

Temporal evolution of financial-market correlations. Physical Review
Fenn, D. J., Porter, M. A., Williams, S., MacDonald, M., Johnson, N. F., and Jones,N. S. (2011).

Hidden Markov Model: Tutorial
Ghojogh, B., Karray, F., Crowley, M.

Between Nonlinearities, Complexity, and Noises: An Application on Portfolio Selection Using Kernel Principal Component Analysis
Yaohao Peng 1 , Pedro Henrique Melo Albuquerque, Igor Ferreira do Nascimento and João Victor Freitas Machado

Common Factors affecting Bond Returns
Litterman, R., Scheinkman, J. (1991)

Thank you!

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