Developing reliable and scalable decision support systems

Nordic MATLAB Expo
April 2016

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Trient Asset Management AS
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Independent asset manager

Fundamentally driven

Extensive use of quantitative analysis

Developing proprietary software
About me

10+ years experience in software development
First half «hacking», second half building systems
Felt the pain of writing «bad» code
Learned (hopefully) something along the way
Passionate about software engineering
Backdrop

38% of scientists spend at least one fifth of their time developing software

47% (only) of scientists have a good understanding of software testing

34% (only) of scientists see formal training in software development as important

Source:
«Why scientific programming does not compute»
Nature, October 2010
“There are terrifying statistics showing that almost all of what scientists know about coding is self-taught. They just don't know how bad they are.”

**Greg Wilson**

*Nature, October 2010*
Content

«It is not enough for code to work.»

Robert C. Martin
Co-author of the Agile Manifesto

Design Stamina Hypothesis

Important aspects of software development

Example of no design vs. good design

Focus: Maintainability and testability

Use case from Trient
Design Stamina Hypothesis

Source: Martin Fowler, 2007
Important aspects of software development

- Maintainability
- Testability
- Reusability
- Extensibility
- Scalability
- Reliability
function pushbuttonRunAnalysis_Callback(hObject, eventdata, handles)
stockTicker = get(handles.textBoxStockTicker, 'String');
field = get(handles.textBoxField, 'String');
date = get(handles.textBoxDate, 'String');

connection = database('CompanySQL', 'dbo', 'Password465', 'Vendor',...
    'Microsoft SQL Server', 'Server', 'MYSRVR4561', 'AuthType', 'Server', 'Portnumber', 1433);

sqlStatement = sprintf(['SELECT Price, Date FROM TimeSeriesView WHERE ',...
    'Ticker = ''%s'' AND Field = ''%s'' AND Date <= ''%s'' ORDER BY Date ASC'],...
    stockTicker, field, date);

cursor = exec(connection, sqlStatement); fetch(cursor); close(cursor);
prices = cursor.Data.Price; dates = cursor.Data.Date;

average = mean(prices); stdev = std(prices); score = (prices(end)-average)/stdev;
valuation = 'In Range';
if (score > 2)
    valuation = 'High';
end
if (score < 2)
    valuation = 'Low';
end

plot(datemnum(dates), prices);
set(handles.textBoxValuation, 'String', valuation);
end
function pushbuttonRunAnalysis_Callback(hObject, eventdata, handles)

stockTicker = get(handles.textBoxStockTicker, 'String');
field = get(handles.textBoxField, 'String');
date = get(handles.textBoxDate, 'String');

prices = handles.DataStore.GetData(stockTicker, field, date);

valuation = handles.SimpleStatsModel.GetValuation(prices.Price);

plot(datenum(data.Dates), data.Prices);
set(handles.textValuation, 'String', valuation);
end
The maintainability of a system \((m)\) is inversely proportional to the coupling – the number of dependencies \((n_d)\)

\[ m \propto \frac{1}{n_d} \]
Testability
“Code without tests is bad code. It doesn't matter how well written it is; it doesn't matter how pretty or object-oriented or well encapsulated it is. With tests, we can change the behavior of our code quickly and verifiably. Without them, we really don't know if our code is getting better or worse.”

Michael Feathers
Author of Working Effectively with Legacy Code
Automated testing

**Unit Tests**
A small automated test, coded by a programmer, that verifies whether or not a small piece of production code – a unit – works as expected in isolation.

**Integration Tests**
An automated test in which individual software modules are combined and tested as a group.
As of R2013a MATLAB has a built-in framework for writing automated tests.
Use case
Use case

Asset class models

Performance and attribution reports
Key takeaways

The design payoff line

Maintenance is inversely proportional to the number of dependencies

Code without tests is bad code
Thank you!

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