

Taking financial documentation to the next level

An application of the MATLAB Report Generator Toolbox

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Quant Analyst at Van Lanschot Kemp

12 October 2022



**VAN LANSCHOT
KEMPEN**



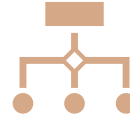
Agenda



Introduction



Motivation



Implementation



Going forward ...

Introduction

Randy Steenbergen

- Academic background in Civil Engineering and Applied Mathematics
- Quant team at Van Lanschot Kempen
- Responsible for the pricing library of Structured Products desk



Van Lanschot Kempen's Structured Products (SP) desk provides tailor made investment solutions

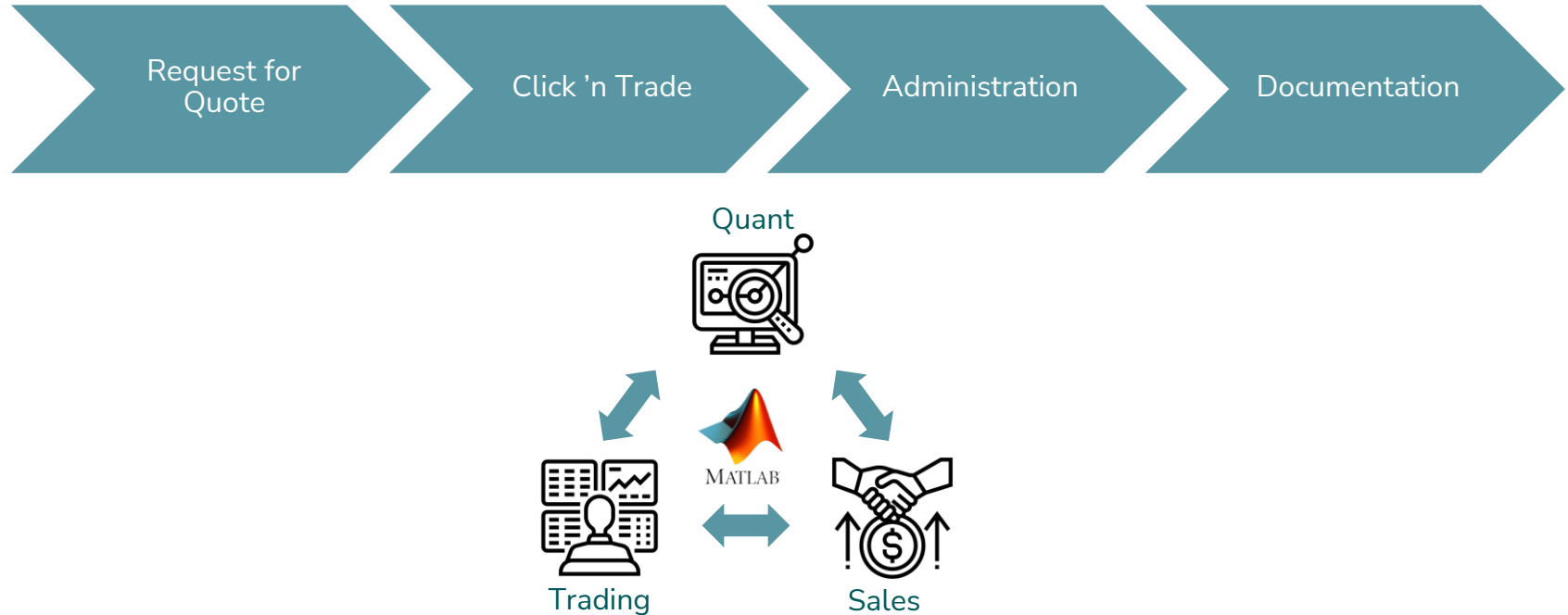
- Participate in stock market with a certain level of protection
- Can be tailored to the market view and risk-return profile of the client:
 - Minimum redemption
 - Leverage
 - Return in flat or moderately decreasing markets
 - Regular income
- Wide variety of product types:
 - Trigger Note
 - Digital Coupon Note
 - Memory Coupon Note
 - Capital Protected Note
 - Fixed Rate Note
 - ...



Motivation



From quote to sealing the deal, MATLAB is very well represented in the SP product chain



Firstly, bankers or advisors will request a quote for a product on our website



- Website with available product types
- Bankers/Advisors fill in product details
- Calculate coupon
- Request a quote

Trigger Info

1 Issuer: Van Lanschot

2 Underlying value: EURO STOXX 50 Index

3 Currencies: EUR

4 Duration: ☐ 5 years

5 Reference date: Annual

6 Redemption Barrier: 100%

7 Coupon Barrier: ☐ 100%

8 Descending with: 0%

9 Memory coupon: Yes

10 Protection level: ☐ 70%

11 Protection level type: European

Calculate Premium (per period)

Calculation explanation

Documentation

Result of calculation

The result of the composite product is:

Premium (per period): 10.10%

More information

Request Trade

Carry out



Hereafter, approval must be granted by one of the Structured Product team members



- Structured Products desk (dis)approves
- Alert client
- Create deal in database

ID	ApprovalDeadline	Username	ProductName
34040	2022-09-22 00:00:00.0	RANDY STEENBERGEN	Trigger EURO STOXX 50 SY 100/100/70 MEM

Request details
Product -
User -
DateTime -
Size -

Calculation result
Result -

Open in SCPro GUI
Approve Reject



If approved, the note must be processed in the database for pricing and documentation



SP Product Data Manager

SP Product Data M

SCPrio Requests Instrument Creation

Insert Product Details

Product Details

1. General Request Details 2. Payoff-specific Details 3. Other Product Details 4. Event Details

Issuer Van Lanschot Kempen N.V.

Underlying FO: AEX Index

Currency EUR

Maturity

Initial Fixing Date 21-09-2022

Issue Date 20-09-2022

SettlementDays 5

Next

Delete Process

- Add product details
- EMT generation
- KID generation
- Add product to website
- ...



Although documentation is required throughout the process, no integrated tool was available yet



Structured Products Desk - Issue Tool 2.0

Type Product: Autocallable
Reference Asset/Rate: Index
Underlying Type: Single
Underlying: Use - to separate multiple underlyings
Issue Date: 09/27/2022
Maturity: 5
Private/Public: Private
Tranche: 1
Jurisdiction: Netherlands
DIP / SNIP: SNIP
Comments:
Suggested Folder Name: 20220927 - 5Y Autocallable
Start
Unhide sheets

- Excel VBA tool:
 - Final Terms
 - Term Sheet
 - Product Leaflet



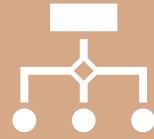
The objective: create a future proof app that is integrated in the tooling of the current workflow



Objective:

- MATLAB GUI
- Integrate in the current infrastructure
- Easy to maintain
- Dynamic data model





Implementation



The app bundles the power of a dynamic data model and the capabilities of the Report Generator toolbox ...

DocumentGenerator

New Instrument

Instrument Type

Underlying Detail

Reference Asset/Rate

ISIN

Comments

Load Instrument

Instrument

Update time

Source ☒ DB ☐ SPPDM



The app bundles the power of a dynamic data model and the capabilities of the Report Generator toolbox ...

DocumentGenerator

New Instrument

Instrument TypeAutocallable

Underlying DetailWorstOfBasket

Reference Asset/RateUKX

Add to Basket

ISINNLTST1234567

Comments

Instrument Title20220810 - WO 5Y Autocallable

	BasketComponents	Weights
DAXK	☒	0.3333
SX5E	☒	0.3333
UKX	☒	0.3333

Instrument Specification

Underlying settings

Specification	SpecificationOptions
Currency	EUR
Denomination	AUD
Issuer	CHF
Jurisdiction	EUR
Listing	GBP
Maturity	NOK
	SEK
	USD

Payment settings

ISINType	NL
Memory	Yes
PaymentFrequency	Annually
RedemptionBarrierPeriod	ObsPeriodEU
ReverseExchangeableAmo...	Amount 1

Other settings

Specification	SpecificationOptions
BalancesConsumers	No

Instrument Feature

Underlying settings

FeatureName	FeatureValue
DivAmount	4
IssuePrice	100
IssueSize	1000000

Payment settings

FeatureName	FeatureValue
ConditionalCoupon	5
CouponBarrier	95
RedemptionBarrierLevel	80
TriggerLevel	100

Other settings

FeatureName	FeatureValue
CommonCode	23456

Instrument Date

Issue Date10-08-2022

Date of Resolution01-09-2022

Expiration Date03-08-2027

Maturity Date10-08-2027

Strike Date03-08-2022

ObsDate	PayDate
2023-08-03	2023-08-10
2024-08-05	2024-08-12
2025-08-04	2025-08-11
2026-08-03	2026-08-10
2027-08-03	2027-08-10

Go Back (Reset)

Save Input

Generate Dates

Create TermSheet

Create FinalTerms

Create ProductLeaflet

1737

14

... to translate user input into document details and Word templates ...

New Instrument

Instrument Type

Autocallable

Underlying Detail

World/Basket

Reference AssetRate

UKX

ISIN

NLTS1224567

Comments

InstrumentTitle

20220810 - WFO 5Y Autocallable

BasketComponents

DAXX

☒

0.3333

XSXE

☒

0.3333

UKX

☒

0.3333

Instrument Specification

Underlying settings

Specification

SpecificationOptions

Currency

EUR

Denomination

PP

Issuer

Von Latschold Kempen AG

Jurisdiction

Kempen Union

Listing

No

Priority

SV

Payment settings

Specification

SpecificationOptions

ISINType

NL

History

Yes

PaymnetFrequency

Annually

RedemptionBarriersField

ObservedEU

ReversedExchangeAmo.

Amount 5

Other settings

Specification

SpecificationOptions

BelgianConsumers

No

Country

Netherlands

Offering

Private

Report

Yes

Instrument Feature

Underlying settings

FeatureName

FeatureValue

DrawAmount

4

%

IssuePrice

100

%

IssueDate

19990909

Payment settings

FeatureName

FeatureValue

ConditionalCoupon

5

%

CouponBarrier

95

%

RedemptionBarrierLevel

99

%

TriggerLevel

100

%

Other settings

FeatureName

FeatureValue

CommonCode

22465

ISINCode

5

SerialNumber

1234

TotalCostFee

2

%

Tranche

1

Instrument Date

Issue Date

19-08-2022

Date of Resolution

01-09-2022

Expiration Date

03-08-2027

Maturity Date

10-08-2027

Strike Date

03-08-2027

ObsDate

2022-08-03

PayDate

2023-08-10

2024-08-05

2024-08-12

2025-08-04

2025-08-11

2026-08-03

2026-08-10

2027-08-03

2027-08-10

[illegible]

Autocallable

1,000,000

EUR

FINAL TERMS

Click or tap here to enter text.

Click or tap here to enter text.

Van Lanschot Kempen N.V.

(Incorporated in the Netherlands with its statutory seat in 's-Hertogenbosch)

Legal Entity Identifier (LEI): 724500D8WOYCL1BUCB80

Issue of Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. **due** Click or tap here to enter text. **under the EUR 2,000,000,000 Structured Note Programme for the issuance of**

Index and/or Equity Linked Notes

Series No. Click or tap here to enter text.
Tranche No. 1

5 Year

Any person making or intending to make an offer of the Notes may only do so in circumstances in which no obligation arises for the Issuer or any Dealer to publish a prospectus pursuant to Article 3 of the Prospectus Regulation or supplement a prospectus pursuant to Article 23 of the Prospectus Regulation, in each case, in relation to such offer.

Neither the Issuer nor any Dealer has authorised, nor do they authorise, the making of any offer of Notes in any other circumstances.

... that form a customized and product specific document

MIIFID II PRODUCT GOVERNANCE / RETAIL INVESTORS, PROFESSIONAL INVESTORS AND ECPS
 – Solely for the purposes of the manufacturer's product approval process, the target market assessment in respect of the Notes has led to the conclusion that: (i) the target market for the Notes is eligible counterparties, professional clients and retail clients, each as defined in Directive 2014/65/EU (as amended, "MiFID II"); and (ii) all channels for distribution of the Notes to eligible counterparties and professional clients are appropriate; and (iii) the following channels for distribution of the Notes to retail clients are appropriate - investment advice, portfolio management and non-advised sales, subject to the distributor's suitability and appropriateness obligations under MiFID II, as applicable. Any person subsequently offering, selling or recommending the Notes (a "distributor") should take into consideration the manufacturer's target market assessment; however, a distributor subject to MiFID II is responsible for undertaking its own target market assessment in respect of the Notes (by either adopting or refining the manufacturer's target market assessment) and determining appropriate distribution channels, subject to the distributor's suitability and appropriateness obligations under MiFID II, as applicable.

Autocallable

1,000,000

FINAL TERMS

Click or tap here to enter text.

Click or tap here to enter text.

Van Lanschot Kempen N.V.
(incorporated in the Netherlands with its statutory seat in 's-Hertogenbosch)

Legal Entity Identifier (LEI): 724500D8WOYCL1BUCB80

Issue of Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. Click or tap here to enter text. **due** Click or tap here to enter text. **under the EUR 2,000,000,000 Structured Note Programme for the issuance of Index and/or Equity Linked Notes**

Series No. Click or tap here to enter text.
Tranche No. 1

Any person making or intending to make an offer of the Notes may only do so in circumstances in which no obligation arises for the Issuer or any Dealer to publish a prospectus pursuant to Article 3 of the Prospectus Regulation or supplement a prospectus pursuant to Article 23 of the Prospectus Regulation, in each case, in relation to such offer.

Neither the Issuer nor any Dealer has authorised, nor do they authorise, the making of any offer of Notes in any other circumstances.

EUR

5 Year

FINAL TERMS

MIIFID II PRODUCT GOVERNANCE / RETAIL INVESTORS, PROFESSIONAL INVESTORS AND ECPS

– Solely for the purposes of the manufacturer's product approval process, the target market assessment in respect of the Notes has led to the conclusion that: (i) the target market for the Notes is eligible counterparties, professional clients and retail clients, each as defined in Directive 2014/65/EU (as amended, "MiFID II"); and (ii) all channels for distribution of the Notes to eligible counterparties and professional clients are appropriate; and (iii) the following channels for distribution of the Notes to retail clients are appropriate - investment advice, portfolio management and non-advised sales, subject to the distributor's suitability and appropriateness obligations under MiFID II, as applicable. Any person subsequently offering, selling or recommending the Notes (a "distributor") should take into consideration the manufacturer's target market assessment; however, a distributor subject to MiFID II is responsible for undertaking its own target market assessment in respect of the Notes (by either adopting or refining the manufacturer's target market assessment) and determining appropriate distribution channels, subject to the distributor's suitability and appropriateness obligations under MiFID II, as applicable.

10 August 2022

Van Lanschot Kempen N.V.
(incorporated in the Netherlands with its statutory seat in 's-Hertogenbosch)

Legal Entity Identifier (LEI): 724500D8WOYCL1BUCB80

Issue of EUR 1,000,000 5 Year Autocallable Index Basket Linked Notes due August 2027 under the EUR 2,000,000,000 Structured Note Programme for the issuance of Index and/or Equity Linked Notes

Series No. 1234
Tranche No. 1

Any person making or intending to make an offer of the Notes may only do so in circumstances in which no obligation arises for the Issuer or any Dealer to publish a prospectus pursuant to Article 3 of the Prospectus Regulation or supplement a prospectus pursuant to Article 23 of the Prospectus Regulation, in each case, in relation to such offer.

Neither the Issuer nor any Dealer has authorised, nor do they authorise, the making of any offer of Notes in any other circumstances.



The data model is very flexible and dynamic, allowing us to limit the hardcoded exceptions

- The SQL data model:
 - Contains instrument characteristics
 - Stores user input
 - Maps user input to templates
 - Maps user input to hole content
- Its dynamic character allows for
 - Different types of instruments, and inputs corresponding to these
 - Adjustments to templates, documents and instruments types
 - New templates, documents and instrument types
 - Adjustments to mappings

For each instrument type, a different set of parameters is loaded in the tables

DocumentGenerator

New Instrument

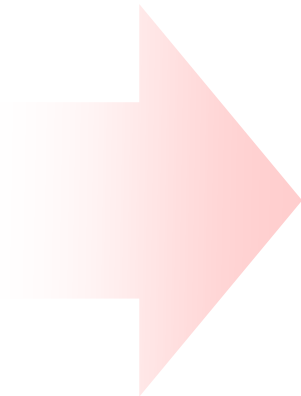
Instrument Type

Underlying Detail

Reference Asset/Rate

ISIN

Comments



Instrument Specification

Underlying settings

Specification	SpecificationOptions
Currency	
Denomination	
Issuer	
Jurisdiction	
Listing	
Maturity	

Payment settings

Specification	SpecificationOptions
ISINType	
Memory	
PaymentFrequency	
RedemptionBarrierPeriod	
ReverseExchangeableAmo...	

Other settings

Specification	SpecificationOptions
BelgianConsumers	
Country	
Offering	
Retail	

Instrument Feature

Underlying settings

FeatureName	FeatureValue
DivAmount	%
DivYears	
IssuePrice	%
IssueSize	
Notional	

Payment settings

FeatureName	FeatureValue
ConditionalCoupon	%
CouponBarrier	%
RedemptionBarrierLevel	%
TriggerLevel	%

Other settings

FeatureName	FeatureValue
CommonCode	
SRIScore	
SeriesNumber	
TotalCostFee	%
Tranche	

Instrument Date

Issue Date

Date of Resolution

Expiration Date

Maturity Date

Strike Date



For each instrument type, a different set of parameters is loaded in the tables

DocumentGenerator

New Instrument

Instrument Type

Underlying Detail

Reference Asset/Rate

ISIN

Comments

Digital

Autocallable

Sweet Autocallable

MemoryCoupon

CPN

Fixed Rate Note

Floating Rate Note

FixedToFloat

Yearly Coupon Plus

Annualized CPN

Bonus

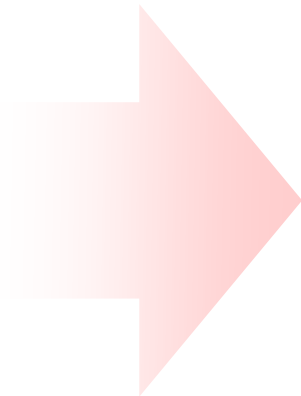
Booster Note

REX

Clicker

Start

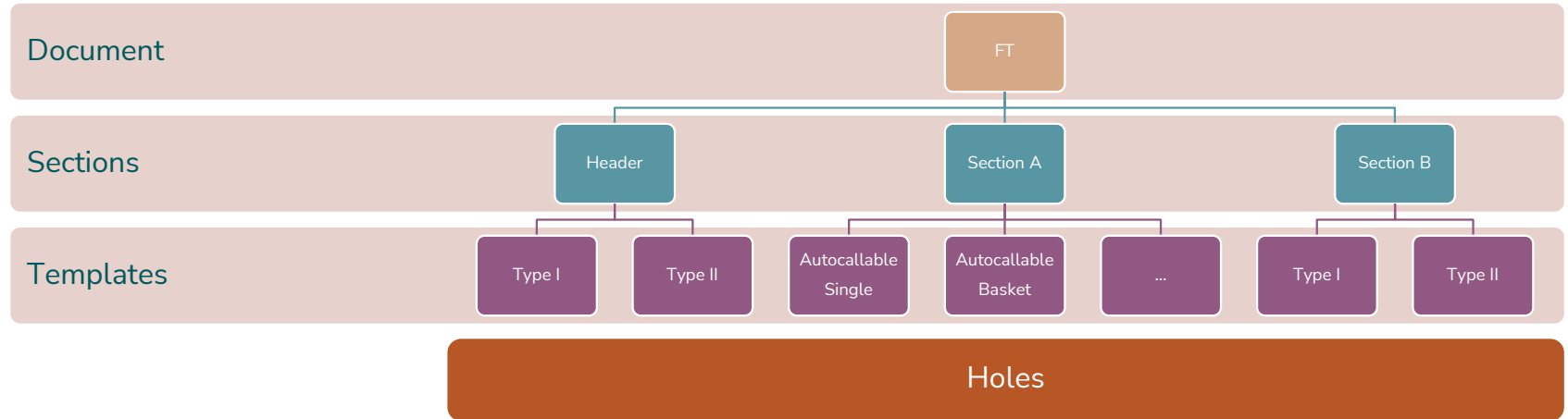
Reset



Instrument Specification		Instrument Feature		Instrument Date	
Underlying settings		Underlying settings		Issue Date	
Specification	SpecificationOptions	FeatureName	FeatureValue	Date of Resolution	
Currency		DivAmount	%	Expiration Date	
Denomination		DivYears		Maturity Date	
Issuer		IssuePrice	%	Strike Date	
Jurisdiction		IssueSize			
Listing		Notional			
Maturity		StrikeLevel	%		
Payment settings		Payment settings			
Specification	SpecificationOptions	FeatureName	FeatureValue		
Asianing		CapitalProtectionLevel	%		
AsianingPeriod		GearingDown	%		
Cap		GearingUp	%		
ISINType		MaxRedemption	%		
		NumberOfDates			
Other settings		Other settings			
Specification	SpecificationOptions	FeatureName	FeatureValue		
BelgianConsumers		CommonCode			
Country		SRIScore			
Offering		SeriesNumber			
PutSpread		TotalCostFee	%		
Retail		Tranche			



Each document consists of several sections, containing standard text and editable holes



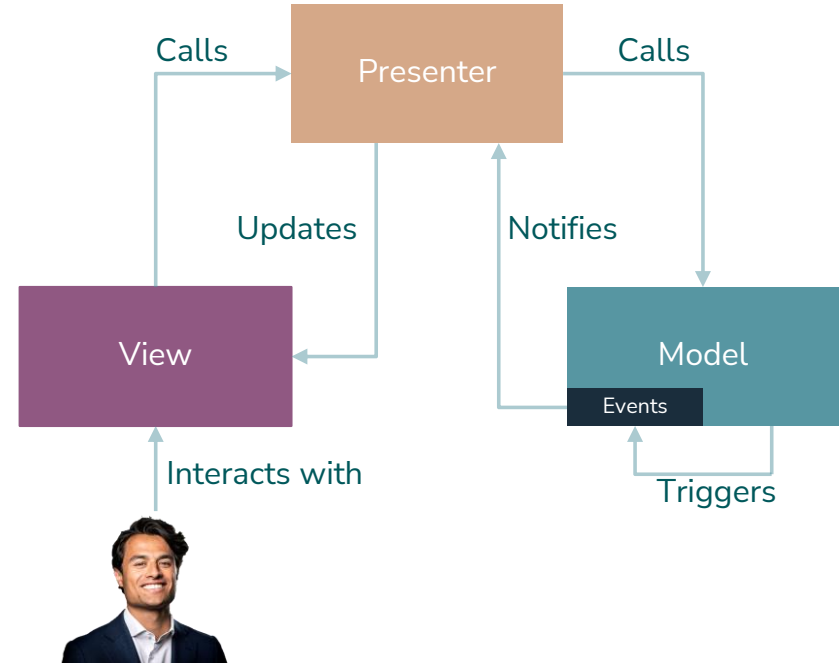
All user input is translated to a unique template for each section and unique content for each hole

- Hole content based on user input
- Database contains mapping from input combinations to unique content for each hole

HoleTitle	Characteristic	User input	Content
IssuerProgramHole	InstrumentType	Autocallable	Van Lanschot Kempen N.V. € 2.000.000.000,- Structured Note Programme
	Issuer	Van Lanschot Kempen	
IssueDate	Issue Date	10-08-2022	10 August 2022
IssueSize	Issue Size	1000000	1,000,000

The user interface is built according to the MVP pattern, using App Designer components

- An inhouse built generic package with:
 - Model.m
 - View.m
 - Presenter.m
- GUI Specific files:
 - DocumentGenerator.mlapp
 - DocumentGeneratorModel.m
 - DocumentGeneratorView.m
 - DocumentGeneratorPresenter.m



The DocumentGeneratorView is used to create the elements on the screen, and contains little to no logic

```
function initView(obj, app)

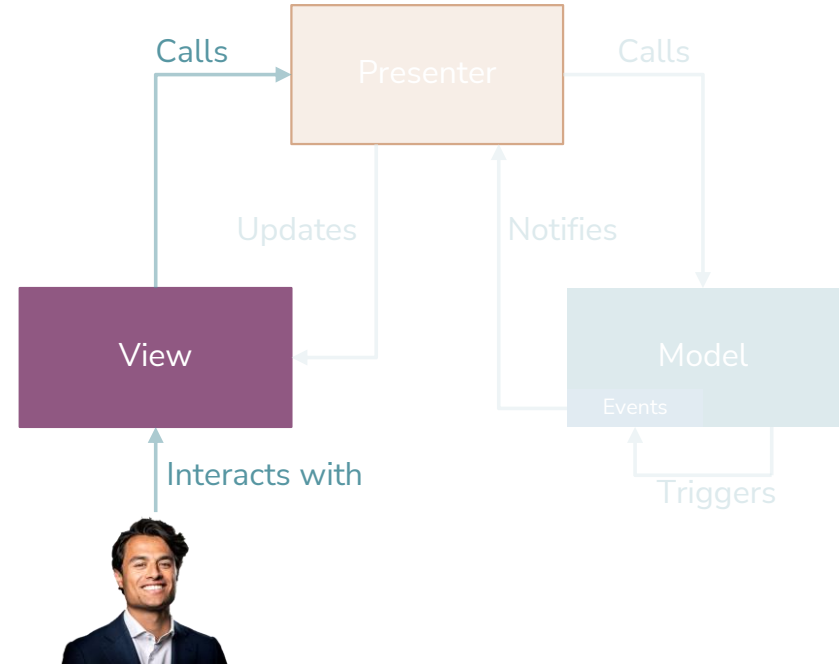
    % Create figure stored in obj.Figure
    fig = obj.createFigureFromApp(app);

    % Create a grid layout stored in obj.MainGridLayout
    mainGridLayout = obj.createGridLayout('Main', 3, 1, ...
        {30, '1x', 100}, {'1x'}, fig);

    % Create a grid layout stored in obj.DocumentButtonsGridLayout
    buttonGridLayout = obj.createGridLayout('DocumentButtons', 1, 7, ...
        {}, {150, 150, 150, 150, 150, '1x', 150}, mainGridLayout, 3, 1);

    % Create a button stored in obj.Buttons.FinalTerms in DocumentButtons
    obj.createButton('FinalTerms', 'Create FinalTerms', ...
        buttonGridLayout, 1, 2);

end
```



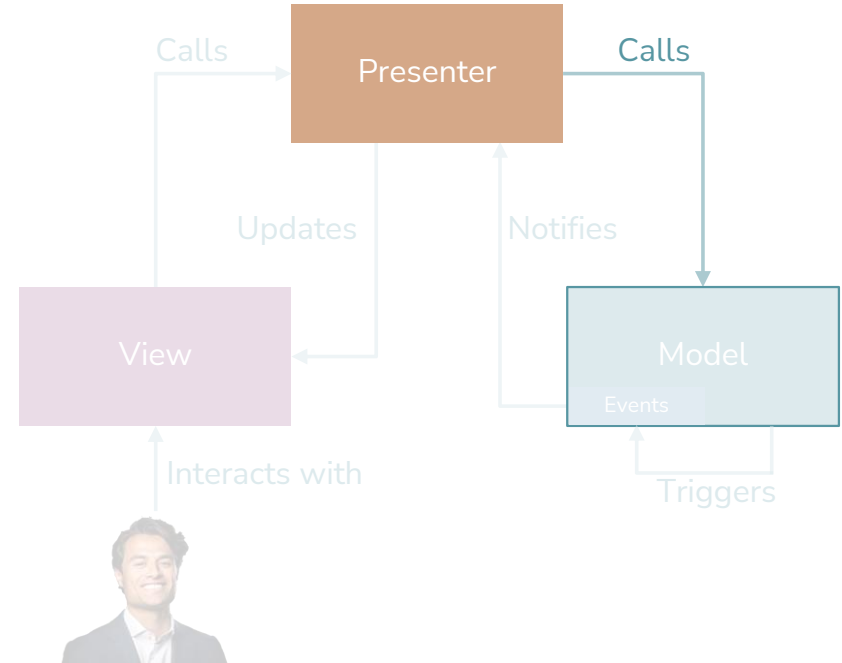
The Presenter class is the mediator between the View and the Model, handling all user interactions

```
function clickButtonFinalTerms(obj, ~, ~)

    % Create a progress bar
    dlg = obj.View.createIndeterminateProgressBar();

    % Save inputs and create Final Terms document
    try
        obj.clickButtonSaveInput();
        obj.Model.createFinalTerms();
    catch ME
        dlg.close();
        obj.View.showErrorDialog(ME.message)
    end

    dlg.close();
end
```



The Model class holds all data that determines the state of the app, and it processes the user input

```
function createFinalTerms(obj)

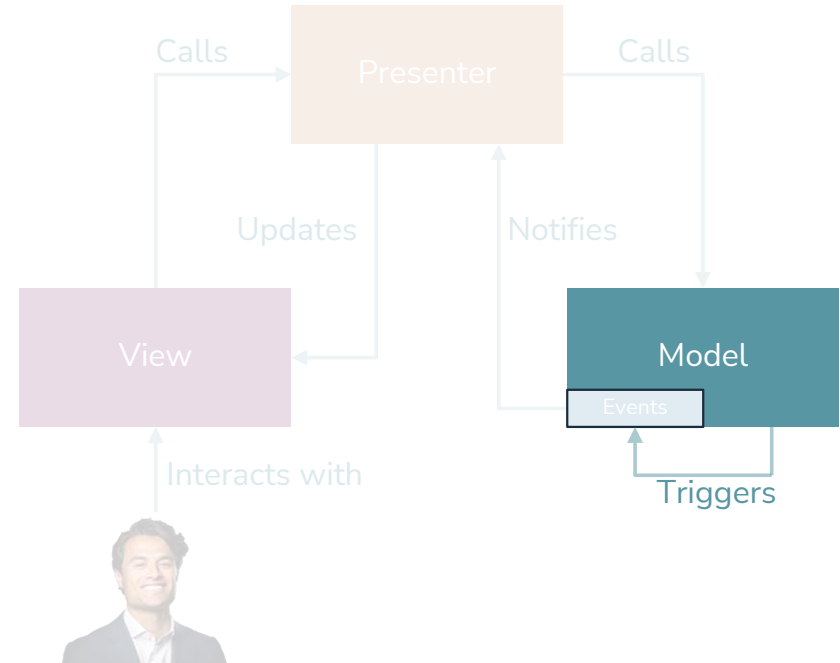
    obj.Logger.log('Creating FinalTerms.')

    % Gather all data (templates and hole input etc.)
    gsc = GetSettingsAndContent(instrId, obj.UpdateTime, ...
        'FinalTerms', obj.InstrumentType);
    outputPath = sprintf('%s FT - %s', obj.OutputPath, ...
        obj.InstrumentTitle);

    % Call the FinalTerms class and create the Document
    try
        finalTerms = FinalTerms.FinalTermsGenerator(gsc.SectionInfo, ...
            gsc.HoleData, gsc.SettingsTable, outputPath);
        finalTerms.initDocumentHoles;
        finalTerms.createDocument;
    catch ME
        error('Failed to creat FinalTerms: %s', ME.message)
    end

    notify(obj, 'CreateDocumentSuccess')
    obj.Logger.log('Successfully created FinalTerms and stored in %s', ...
        outputPath)

end
```

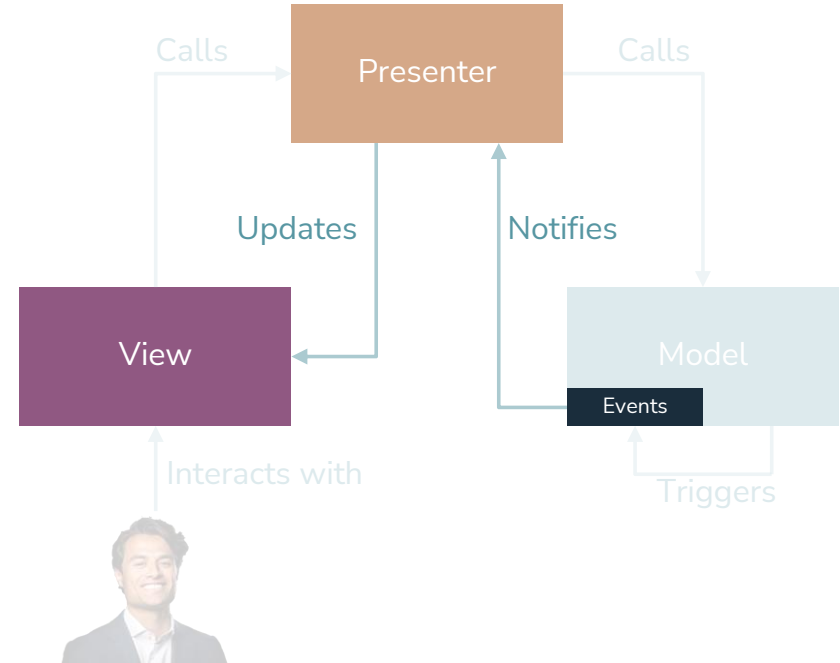


After the Model has emitted an event, the Presenter updates the View

```
function handleCreateDocumentSuccess(obj, ~, ~)

  obj.View.showSuccessDialog(sprintf(['Successfully created ' ...
    'document. Document will appear as a pop-up and is stored' ...
    ' in %s'], obj.Model.OutputPath))

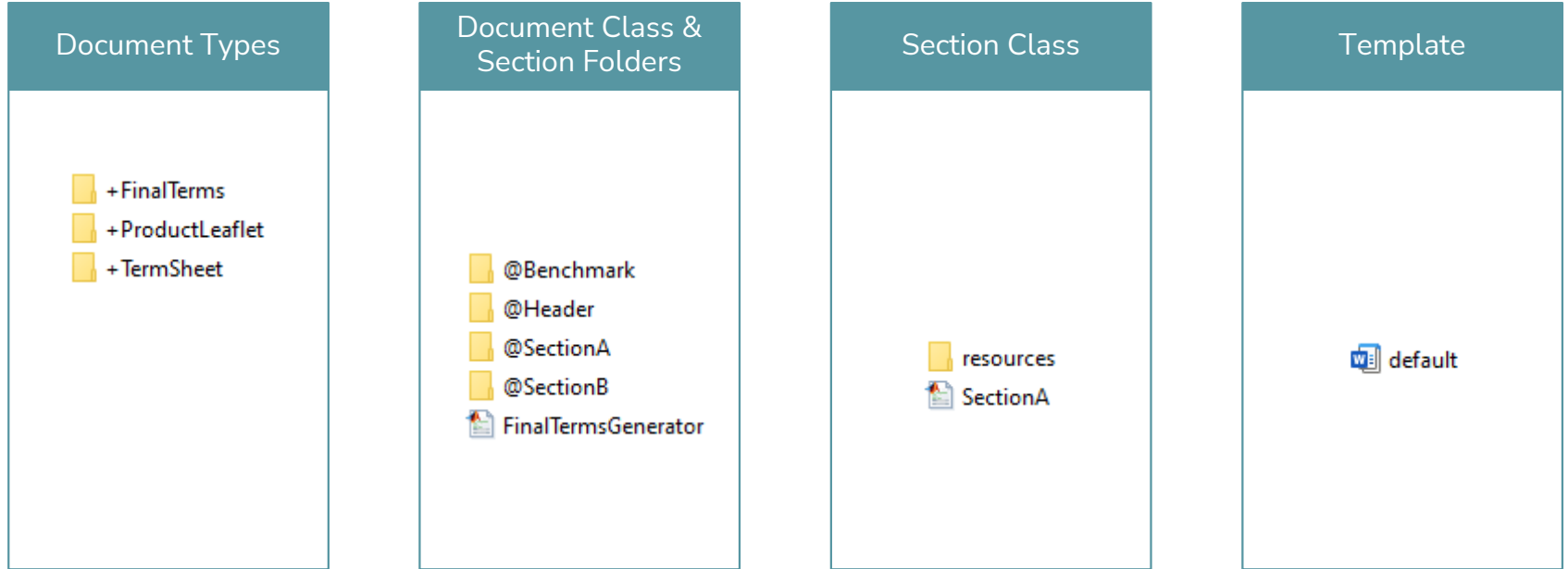
end
```



Our Document Generator is a fully customized report building tool, leveraging the capabilities of the toolbox

- We use the Report Generator toolbox to generate a Word file
- This part is implemented as an, object-oriented, modular tool, consisting of three main categories:
 - Processors: retrieve and process inputs
 - Templates: classes representing the documents and sections
 - Generators: classes to fill and generate documents

The structure of the folders containing the template files, reflects the documents' hierarchical structure



With the help of the Report API, the Document Class and children are stored in a similar way

- This folder structure is easily created using a single command:
 - `customizeReporter(+FinalTerms/@SectionA)`

```
classdef SectionA < mlreportgen.report.Reporter

    properties
    end

    methods
        function obj = SectionA(varargin)
            obj = obj@mlreportgen.report.Reporter(varargin{:});
        end
    end

    methods (Hidden)
        function templatePath = getDefaultTemplatePath(~, rpt)
            path = FinalTerms.Section.getClassFolder();
            templatePath = ...
                mlreportgen.report.ReportForm.getFormTemplatePath(...
                    path, rpt.Type);
        end
    end

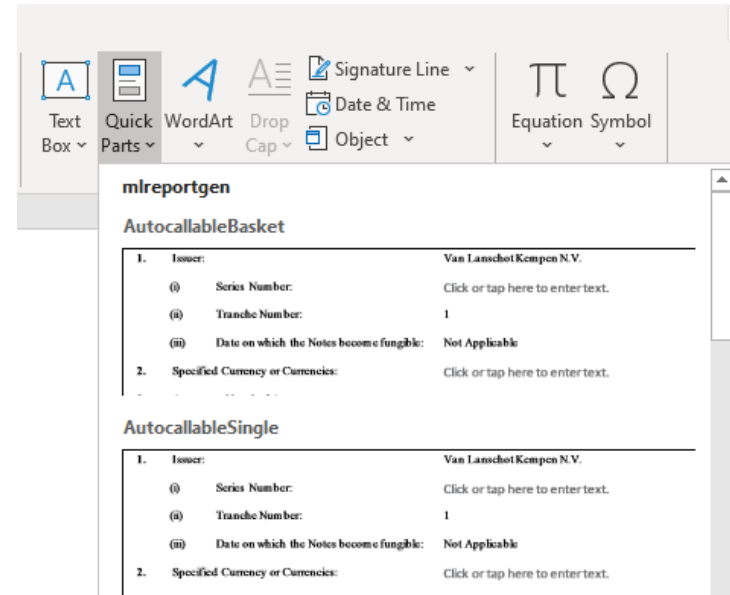
    methods (Static)
        function path = getClassFolder()
            [path] = fileparts(mfilename('fullpath'));
        end

        function createTemplate(templatePath, type)
            path = FinalTerms.Section.getClassFolder();
            mlreportgen.report.ReportForm.createFormTemplate(...
                templatePath, type, path);
        end

        function customizeReporter(toClasspath)
            mlreportgen.report.ReportForm.customizeClass(...
                toClasspath, "FinalTerms.Section");
        end
    end
end
```

In order to fully utilize the toolbox's capabilities, some adjustments must be made

- This folder structure is easily created using a single command:
 - `customizeReporter(+FinalTerms/@SectionA)`
- Some manual adjustments must be made:
 - Adding the templates to the default file



In order to fully utilize the toolbox's capabilities, some adjustments must be made

- This folder structure is easily created using a single command:
 - `customizeReporter(+FinalTerms/@SectionA)`
- Some manual adjustments must be made:
 - Adding the templates to the default file
 - Adding the holes in all the templates as property in the Section class
 - Replacing the super class of the `@SectionA` with `DocumentFiller`

```
classdef SectionA < DocumentFiller

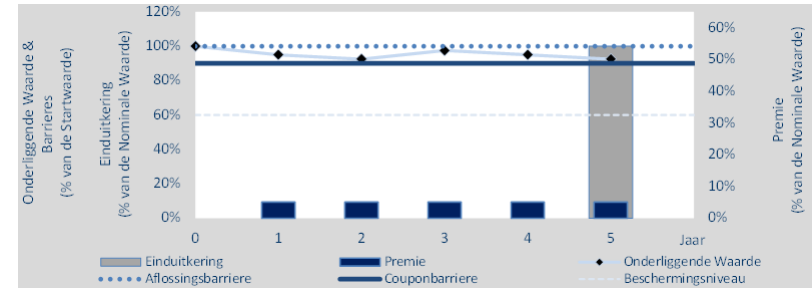
    properties
        NotesTitleHole
        InstrumentTypeHole
        IssueDate
        UnderlyingTable
    end

    methods
        function obj = SectionA(varargin)
            obj = obj@DocumentFiller('SectionA', varargin{:});
        end
    end
end
```

By filling all holes in a single file, we keep a clear overview and things are easy to maintain

- The DocumentFiller is the file dedicated to assigning data to the templates' holes
- Holes can be of all types:

- Text
- Date
- Image
- Table
- Graph



Conditional Coupon Observation	
25 August 2023	
26 August 2024	
25 August 2025	
25 August 2026	
25 August 2027	

Document Classes contain the Sections as properties, and let the DocumentCreator do the thinking

- Each Document Class has a property for every Section in that Document Type
- The Document Classes, like the Section Classes, are kept as brief as possible, containing:
 - Document specific checks:
 - Are all sections passed on by the Processors
 - Document specific exceptions:
 - Preprocessing templates

```
classdef FinalTermsGenerator < DocumentCreator

    properties

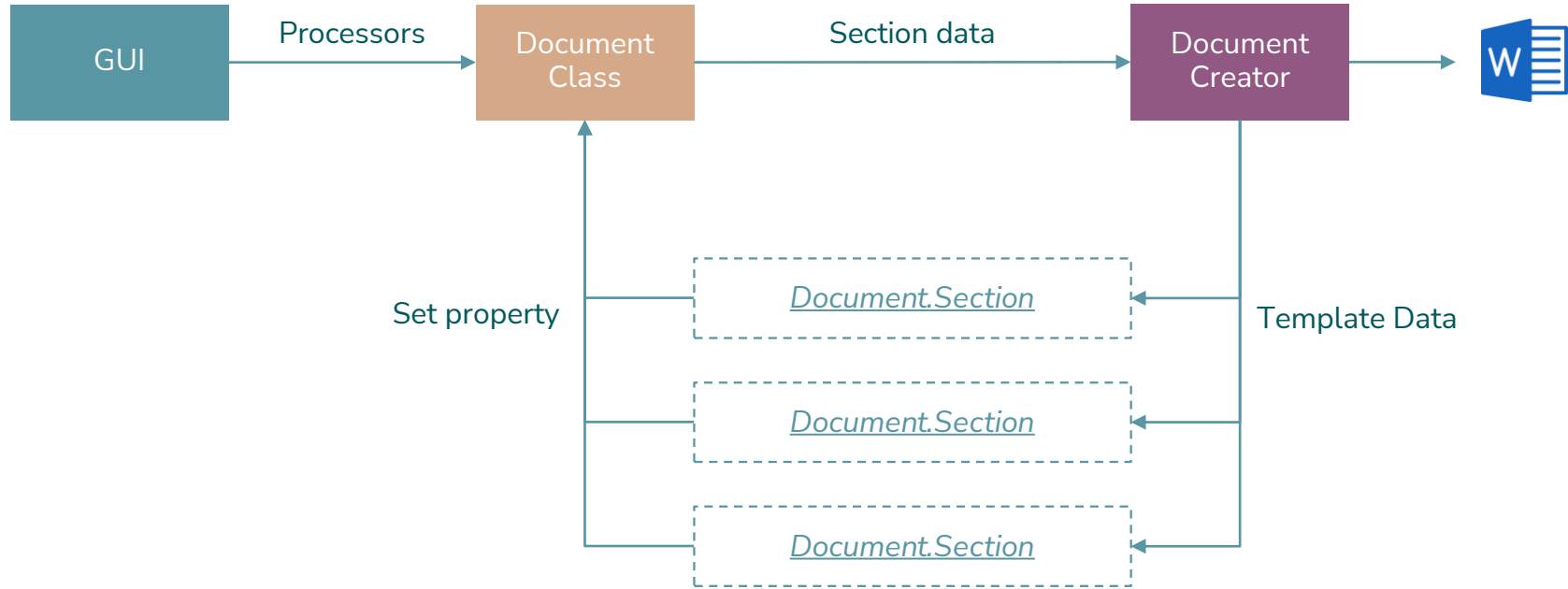
        Benchmark
        Header
        SectionA
        SectionB

    end

end
```



The DocumentCreator calls the sections, postprocesses them, and creates the document



Conclusion: the Document Generator satisfies our main criteria

- To conclude, we have achieved our objective with a tool that is:
 - Integrated in the current infrastructure
 - Easy to maintain
 - Dynamic data model



Going forward



Currently, we are rebranding our documents; the Document Generator's flexibility simplifies this process

- Our company is rebranding all its documents
- The Document Generator proves its value, as there are only two steps involved:
 - New templates containing the same information in a new format
 - Add templates to the resources in the section folders
- The whole process does not involve any adjustments to the MATLAB code or database

Questions?



VAN LANSCHOT
KEMPEN