



April 25, 2018

Data Analytics / Predictive Analysis

Investment Considerations

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Retirement and
Institutional Services

Investment Risk

■ External Factors – What We Can't Control

- Governmental Regulation
- Markets
- Interest Rates
- Credit Quality
- Geo/Political
- Document Restrictions

■ Internal Factors – What We Can

- Committee Structure
- Policies and Procedures
- Decision Making
- ***Account Coding***
- ***Process***
- ***Consistency of Application***



Today's Session

1. Maintain data integrity in your core systems
2. Use data analysis to know where you're doing a great job
 . . . and uncover inconsistencies that cause trouble spots
3. Satisfy management information reporting needs



Key Points

1. Maintain data integrity

- Protect the integrity of system of record
- Determine standards and ensure adherence
- Create procedures and processes for regular evaluation of data
- Ensure a well-defined process for making change
- Identify errors and their cause



Key Points

2. Data analysis helps identify the positives and the negatives

- Define needed metrics
- Create processes
- Use simple queries -- commercial and in-house designs
- Develop sophisticated techniques
- Validate formulas and tools
- Avoid manual intervention by automating, when possible



Key Points

3. Satisfy management information reporting

- Regulatory compliance
- Company objectives
- Appropriate levels of detail



Commercial vs. In-House Solutions

- Cost
- Flexibility
- Rigidity
- Applicability
- Dependability
- Reliability
- Continuity
- Accountability



Considerations

- Regulatory
- Policies and procedures
- System coding
- Client IPS
- Process
 - Formal (portfolio review committee “PRC”) and
 - Working (supervisory)
- Management and officer level reporting



Parameters

- Investment authority
- Investment objective – Defined by investment policy statement (“IPS”)
- Asset class
- Portfolio allocation
- Security overweights
- Security quality
- Permissible investments



Basic Elements – One-Off Approach

- E.g., LMI in AddVantage – Are critical fields coded?
- Can produce false or incomplete readings
 - If statements are produced at the master level
 - Fields that make sense when considered together, e.g., investment authority and investment objective



The Next Level

- Extracting specific data using MS Query
 - For spreadsheet analysis
 - Format as Table
 - Pivot Tables
 - Grouping
- Caution: “Completeness” of the extract if more than 2 tables are queried at once
- A more complex/sophisticated approach may be required, especially for “predictive” analysis



Predictive Elements

■ Potential Portfolio Review Issues

- Assets nearing over-weight positions
- Assets not on the “Approved List”
- Investment allocation approaching un-wanted levels
- Cash investments nearing over-/under-weight levels
- Changes to related fields, e.g., investment objective, authority, IO

■ Responsiveness to Client Needs

- Non-model assets
- Assets falling outside requisite weightings



Detailed Analysis

- Often the responsibility of the portfolio manager and account officer
- Only basic parameters are calculated for PRC
- Details must be visually “observed” at PRC
- Alternatively, much of the analysis can be accurately performed through custom programming
- Ensures that correct allocations, assets and proportions are being employed
- Especially when used in concert with robust, consistent use of tactical model portfolios



More Complex Reporting Needs

- Detailed Exception Reports for
 - Risk Officers
 - AOs and IOs
- Full Account Load Reporting for AOs and IOs
- Supervisory Summary and Detail Reports
- Executive Summaries



Additional Obstacles

- Multiple accounts/sub-accounts
- Multiple platforms accounting, trading, etc.)
- Pre-packaged reporting that isn't quite on target



One Solution

- In-house database application
- Permanent linkages to external data sources
- Creation of custom tables, e.g., Fee Projection Report
- Define entire workflow
- Perform complex analysis
 - Comprehensive querying techniques
 - Highly customized reporting



In-House Database Application

- Primary Form – Switchboard – with clearly defined steps, hyperlinks, macros
- Hyperlinks to run an external query or go to a specific location
- Macros to reliably run a certain group of actions in a required progression to ensure accuracy and completeness
 - Run a query that creates a table and opens it in design view for indexing
 - Automatically output a query or report to Excel, Word or as a PDF and save it to a specific location in your network



Database Considerations

- Tables – create, link, import
- Linked and imported data can be cumbersome, use queries to create unique and specific tables to suit your needs
- Index appropriate fields
- Access limitation – 2.1 gigabytes
- Compact and Repair



Database Switchboard – Form

AddVantage Research TRP

Prep 1 Prep 2 Gen Info Fees Relatnshps IPS Rpts IIA Rpts 1 IIA Rpts 2 Corp Rpts RIS Fees Other Rpts

Create Tables

[Open Create Account AOD Mkt Values in Design View](#) Import MVs from Chris Klaine's database. Expand the width of columns 3 and 4 of the query. Select the desired column from his database for which to import market values in column 3 of the query; HOWEVER, THE NAME OF THE CONTROL MUST ALWAYS REMAIN 'Mkt Value'. Then change the date in column 4 of the query to the as of date of the market value data.
Index: Account_Number * BI1_Short_Name

[Create Account AOD Mkt Values](#) Index: Account Number * Short Name * Short Title * Alternate Number

[Create BI-PI-IV-MV-UD As of Date Table](#) Index: Acct Num

[Create Accounts Coded As Closing](#) Index: Account Number * Short Name * Short Title

[Create Mstr BI-PI-IV-MV-UD As of Date Table](#)

[Create Officer Tables](#) Table #7 Opens in Design View: Convert Officer Code to TEXT

[View Table #1 RIS IM Codes](#)

[Open Table #1](#) Update RIS IM codes, then rerun macro, if changes have been made

[Create Officer Branch Code Tables](#)

[Create Branch Codes LOB Tables](#)

[Create Officer Div Code Tables for AOs and IOs](#)

[Create Account Type and Sub-Type Tables](#) Index: First Field in Each Table

[Create BI-PI ALL Accts table](#) Index: Account_Number * Short_Name

[Create Inv Objectives Table 29 with Allocations](#) Index: Inv Objective

[OPEN Inv Objectives Table 29 with Allocations](#) Make certain allocations are correctly assigned to each Investment Objective

[Create Inv Strategy Table 24 with Allocations](#) Index: Strategy Num

[OPEN Inv Strategy Table 24 with Allocations](#) Make certain allocations are correctly assigned to each Investment Strategy

[Create Acct Stmt Table](#) Index: Related Account Number * Interested Party Number

[Create Acct Stmt Table with Stmt Freq](#) Index: Account Number * Short Name

[Create Fee Blocks--Central Accts table](#) Index: Account Number * Acct Short Name * Fee Schedule

[Create Fee Blocks--Master Accts table](#) Index: Mstr Acct Num * Mstr Short Name * Central Acct * Fee Schedule

[Create Fee Mstrs De-duped Table](#) Index: ALL FIELDS

[Create 'Security Master BI' table](#) Index: CUSIP * Print_Name_01

[Create 'Security Master Issuers BI' table](#) Index: Issuer * Issuer_Name

[Create Party BI Table](#) Index: IP # * IP Short Name * FULL NAME 01

[Create Proxy Voting by IP](#) Index: ACCOUNT_NUMBER



Database Switchboard

AddVantage Research TRP

Prep 1	Prep 2	Gen Info	Fees	Relatnshps	IPS Rpts	IIA Rpts 1	IIA Rpts 2	Corp Rpts	RIS Fees	Other Rpts
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Fee Projections

[Fee Summary Grand Total--History](#) If the date for which you want a fee projection is not in the table, follow these steps:
 On the 1st business day of the month, run a Fee Projection Report in VPI for an entire year. At the Account Number prompt, enter 'All +M'. Print to a File (PF) with the name 'FEES_YYYYMMDD.dat'.

Open an AMI session, and go to the Personal Folder. Select the file and save it to Trust\

Open Excel, then open the file from Excel and follow the prompts to parse the fields using the Fixed Width Option. When the file is open:

- Sort all the data on the account number field, then delete all the rows that do not contain account numbers at the bottom of the spreadsheet.
- Eliminate all the asterixes and spaces in the Totals fields using the Find and Replace tool.
- To the right of the Totals column, add a date column -- yesterday's date.
- Save the file as an Excel Workbook to the same location.
- Do not close the file. Copy all the data.

Copy and Paste Append the data to the following two tables:

[Fees as of Table](#) Open the table, delete the contents, and Paste Append the new data.

[Fees as of History Table](#)



Database Considerations

- Establish **data** in a unique database, segregating it from the application
- Determine population – only accounts with a market value or projecting a fee, include/exclude internal accounts, duplicates caused by common funds
- Create tests for duplicate data – accounts, fees, market values – SUM queries
- Test for completeness – ascertain that the full data population is included – initial population (query) vs. the final
- Determine what numbers must reconcile – e.g., within reporting application or to other company applications or to RC-T



Database Tables

- Query sources of data to create your own, indexed tables – far more efficient and greater responsiveness
- Create enhanced tables in the database
 - Normal investment objective table may contain code and description
 - Add elements such as equity weight, fixed income type, a code to specify current versus out-of-date codes, etc.
 - Create queries and a macro to update the table without losing your current coding, while picking up new objectives that are added from time to time
- As a string of queries grows, choose a point to create a table -- enhances response times of reporting and facilitates more querying



Example 1 – IPS Reporting

- Company Requirements – e.g., Update or Re-Confirm Every 3 Years
- Enter Date in the Trust System – Use Date Field
- Display Date in Reviews
- Create Reporting Process for Management, Investment Officers, Administrative Officers



Example 1 – IPS Reporting

- Get ahead of formal review process
- Summary and detail reports
- Exceptions



Investment Policy Exceptions

Investment Manager IPS Update -- Exceptions -- IM Summary

	<u>Primary IPS Status</u>			<u>Missing Primary IPSs</u>
	<u>Due Now</u>	<u><6 Mos</u>	<u>6-12 Mos</u>	
Investment Manager Ann	3	25		3
Investment Manager Bill	1			1
Investment Manager Don			1	
Investment Manager Liz	4	4	2	4
Investment Manager Mike	3	5	4	
Investment Manager Nicole		1		
Investment Manager Racine				
Investment Manager Ted		15	1	



Investment Policy Exceptions

Investment Manager IPS Update -- Exceptions -- Account Summary

Acct Name	Number	Consultant	IPS Date	Primary IPS Status			Prime IPS Missing		Auth	Obj	New	Objective	Ac
				Due Now	<6 Mo	6-12 Mo	Sub IPS Missing	Mis-Match					
██████ FND STMT	██████	MAUREEN ██████	10/13/2011		1				S	27		TOTAL RETURN: 70% EQ/30% (TX)	
██████ W/O ██████	██████	MAUREEN ██████	11/22/2017					6	S	5		EQUITY EMPHASIS (TX)	
██████ ██████	██████	MAUREEN ██████	12/09/2009		1				S	5		EQUITY EMPHASIS (TX)	
██████ LC STMT H	██████	MAUREEN ██████	04/14/2014		1				S	5		EQUITY EMPHASIS (TX)	
██████ ASSOCIATES TR	██████	BRYAN L ██████	01/24/2013		1				S	25		FIXED INCOME ONLY (TX)	
██████ FOUND STMT	██████	MAUREEN ██████	10/23/2013		1				S	38		EQUITY/INCOME - 65/35	
██████ ██████ ST-MIL	██████	BRYAN L ██████	11/14/2017					3	S	GM	NEW	INC-GR/ACT/CONSTRAIN/(No EM)-II	
██████ ██████ STMT	██████	ROBERT ██████	11/13/2013		1				S	5		EQUITY EMPHASIS (TX)	
██████ ██████ STMT	██████	GREGORY ██████	10/12/2017					1	S	21		INCOME FOCUS (TE)	
██████ CHAR STMT	██████	MAUREEN ██████	11/14/2013		1			4	S	27		TOTAL RETURN: 70% EQ/30% (TX)	
██████ INT-STMT	██████	ANDREW ██████	12/02/2010		1				S	7		BALANCED (TX)	
██████ ██████	██████	ANDREW ██████	12/02/2010		1				S	0		OTHER	
██████ ██████ ST	██████	ANDREW ██████	05/23/2014		1			1 1	S	9		INCOME EMPHASIS (TX)	
██████ EAS STMT	██████	MAUREEN ██████	03/14/2012		1				I	27		TOTAL RETURN: 70% EQ/30% (TX)	
██████ ██████ STMT	██████	MAUREEN ██████	11/21/2017					3	S	0		OTHER	
██████ ██████ STMT	██████	MAUREEN ██████	05/20/2015		1				S	27		TOTAL RETURN: 70% EQ/30% (TX)	
██████ ██████ H STMT	██████	MAUREEN ██████	11/10/2015			1			J	5		EQUITY EMPHASIS (TX)	
██████ ██████ STMNNT	██████	ANDREW ██████	08/20/2013		1				S	0		OTHER	
██████ ██████ STMT	██████	ANDREW ██████	08/20/2013		1				S	0		OTHER	
██████ ██████	██████	MAUREEN ██████	08/19/2014		1				S	27		TOTAL RETURN: 70% EQ/30% (TX)	



Example #2 – Portfolio Analysis

- Detail and Summary for the Investment Manager
- Supervisory Detail and Summary
- Executive Summary



Investment Implementation Risk

FDx MV as of 20170906
 AddV MV as of 09/06/2017
 AddV Fee as of 08/31/2017

2 FDx Sleeve Summary

JAY [REDACTED]

[REDACTED] STMT [REDACTED]
 Inv Obj: 5 EQUITY EMPHASIS (TX) – 60.0% Equity, Taxable Fxd
 Auth: SOLE

AddV MV: 2,725,010 | Fee Projection: 29,388
 FDx MV: 2,725,291 | Fees Taken: 28,925
 From 8/5/2016 through 7/10/2017

<u>FDx Mkt Val</u>	<u>% FDx</u>	<u>Security Asset Class</u>	<u>FDx Mkt Val</u>	<u>% FDx</u>	<u>FDx Sleeve Asset Class</u>	<u>FDx Mkt Val</u>	<u>[REDACTED] Inv Strategy</u>	<u>Port %</u>	<u>Mod %</u>	<u>Hldgs</u>	<u>Mod Hld</u>
40,589	1.5%	FDX Cash	1,040,437	38.2%	Equity--Dom	40,589	FDX Cash	1.5%	1.0%	4	
1,487,755	54.6%	Equity	487,399	17.9%	Equity--Int'l	744,782	LARGE CAP	27.3%	27.6%	35	35
130,791	4.8%	Balanced	1,066,585	39.1%	Fixed Income	157,737	MID CAP	5.8%	6.0%	40	40
1,066,157	39.1%	Fixed Income	130,791	4.8%	Alternative	97,836	SMALL CAP FDS	3.6%	3.6%	2	2
			78	0.0%	OTHER	487,399	INTERNATIONAL FDS	17.9%	18.0%	3	3
						130,791	ALTERNATIVE INV FDS	4.8%	4.8%	1	1
						1,066,157	CORE FIXED	39.1%	40.0%	36	45

SOLE TRUSTEE UNDER AGMT-IRREV

[REDACTED] CHARI [REDACTED] Authority: SOLE

AddV Objtv: AddV: 25--FIXED INCOME ONLY (TX)
 FDx Objtv: FDx: --
 IMA:

	<u>Current *</u>	<u>Target</u>	<u>Diff</u>
20 BBT IIA - CORE FIXED INCOME [INDIV BONDS]	1,066,585	100.0%	
FDx Central Acct Total	1,066,585		
AddV Central Acct Total	1,066,180		

Report Design

- Sub-reports for added flexibility
- Wide array of calculation options



Investment Implementation Risk

FDx MV as of 20170906
 AddV MV as of 09/06/2017
 AddV Fee as of 08/31/2017

2 FDx Sleeve Summary

JAY [REDACTED]

[REDACTED] STMT [REDACTED]
 Inv Obj: 5 EQUITY EMPHASIS (TX) – 60.0% Equity, Taxable Fxd
 Auth: SOLE

AddV MV: 2,725,010 | Fee Projection: 29,388
 FDx MV: 2,725,291 | Fees Taken: 28,925
 From 8/5/2016 through 7/10/2017

FDx Mkt Val	% FDx	Security Asset Class
40,589	1.5%	FDX Cash
1,487,755	54.6%	Equity
130,791	4.8%	Balanced
1,066,157	39.1%	Fixed Income

FDx Mkt Val	% FDx	FDx Sleeve Asset Class
1,040,437	38.2%	Equity--Dom
487,399	17.9%	Equity--Int'l
1,066,585	39.1%	Fixed Income
130,791	4.8%	Alternative
78	0.0%	OTHER

FDx Mkt Val	Inv Strategy	Port %	Mod %	Hldgs	Mod Hld
40,589	FDX Cash	1.5%	1.0%	4	
744,782	LARGE CAP	27.3%	27.6%	35	35
157,737	MID CAP	5.8%	6.0%	40	40
97,836	SMALL CAP FDS	3.6%	3.6%	2	2
487,399	INTERNATIONAL FDS	17.9%	18.0%	3	3
130,791	ALTERNATIVE INV FDS	4.8%	4.8%	1	1
1,066,157	CORE FIXED	39.1%	40.0%	36	45

SOLE TRUSTEE UNDER AGMT-IRREV

[REDACTED] CHARI [REDACTED] Authority: SOLE

AddV Objtv: AddV: 25--FIXED INCOME ONLY (TX)
 FDx Objtv: FDx: --
 IMA:

	Current *	Target	Diff
20 BBT IIA - CORE FIXED INCOME [INDIV BONDS]	1,066,585	100.0%	
FDx Central Acct Total	1,066,585		
AddV Central Acct Total	1,066,180		

Investment Implementation Risk

STMT

Inv Obj: 5 EQUITY EMPHASIS (TX) – 60.0% Equity, Taxable Fxd
 Auth: SOLE

<u>FDx Mkt Val</u>	<u>% FDx</u>	<u>Security Asset Class</u>
40,589	1.5%	FDX Cash
1,487,755	54.6%	Equity
130,791	4.8%	Balanced
1,066,157	39.1%	Fixed Income

<u>FDx Mkt Val</u>	<u>% FDx</u>	<u>FDx Sleeve Asset Class</u>
1,040,437	38.2%	Equity--Dom
487,399	17.9%	Equity--Int'l
1,066,585	39.1%	Fixed Income
130,791	4.8%	Alternative
78	0.0%	OTHER

DIANE

AddV MV:	2,725,010	Fee Projection:	29,388
FDx MV:	2,725,291	Fees Taken:	28,925

From 8/5/2016 through 7/10/2017

<u>FDx Mkt Val</u>	<u>Inv Strategy</u>	<u>Port %</u>	<u>Mod %</u>	<u>Hldqs</u>	<u>Mod Hld</u>
40,589	FDX Cash	1.5%	1.0%	4	
744,782	LARGE CAP	27.3%	27.6%	35	35
157,737	MID CAP	5.8%	6.0%	40	40
97,836	SMALL CAP FDS	3.6%	3.6%	2	2
487,399	INTERNATIONAL FDS	17.9%	18.0%	3	3
130,791	ALTERNATIVE INV FDS	4.8%	4.8%	1	1
1,066,157	CORE FIXED	39.1%	40.0%	36	45



Investment Implementation Risk

AGENT-INVESTMENT DISCRETION

IMA Authority: SOLE
AddV Objtv: AddV: EF--BAL/ACTIVE/CONSTRAINED/(EM)
FDx Objtv: FDx: 3454575--SCM - DOMESTIC LEGACY BALANCED AAM
IMA:

		Current *	Target	Diff	
1	Unassociated	99,397	2.1%		
10	EMKT - EMERGING MARKETS EQUITY	96,254	2.1%	2.0%	0.2%
11	EMKT - DEVELOPING MARKETS FUND	94,775	2.1%	2.0%	0.1%
20	FI DTIPS - REAL RETURN FUND	55,501	1.2%	1.2%	0.0%
23	DEQ MCG - GROWTH OPPORTUNITIES	210,064	4.6%	4.4%	0.2%
24	IEQ LCV - INTERNATIONAL VALUE INSTITUTIONAL FUND	199,757	4.4%	4.5%	(0.1%)
25	IEQ LCG - INTERNATIONAL EQUITY INSTITUTIONAL	250,795	5.5%	5.3%	0.2%
28	DEQ SCG - SMALL CAP GROWTH	65,902	1.4%	1.2%	0.2%
30	FI DFI - TOTAL RETURN BOND FUND	516,308	11.3%	11.5%	(0.1%)



Investment Implementation Risk

FDx MV as of 20170906
 AddV MV as of 09/06/2017
 AddV Fee as of 08/31/2017

1 Asset Class Summary

JAY [REDACTED]

[REDACTED] **[REDACTED]** **[REDACTED]** **KATHRYN [REDACTED]**

Inv Obj: EF BAL/ACTIVE/CONSTRAINED/(EM) – 60.0% Equity AddV MV: 362,276 Fee Projection: 5,076
 Auth: SOLE FDx MV: 362,276 Fees Taken: 4,828
 From 8/5/2016 through 7/10/2017

SOLE TRUSTEE UNDER AGMT-IRREV Accounts: 1 Sleeves: 18 [REDACTED]

FDx Mkt Val	% FDx	Security Asset Class	FDx Mkt Val	% FDx	FDx Sleeve Asset Class	FDx Mkt Val	Inv Strategy	Port %	Mod %	Hldqs	Mod Hld
66,242	18.3%	FDX Cash	136,879	37.8%	Equity--Dom					0	
218,190	60.2%	Equity	55,274	15.3%	Equity--Int'l						
77,845	21.5%	Fixed Income	14,723	4.1%	Equity--Emerging Mkts						
			11,349	3.1%	Equity--Global						
			138,882	38.3%	Fixed Income						
			5,170	1.4%	OTHER						

[REDACTED] **[REDACTED]** **[REDACTED]** **KATHRYN [REDACTED]**

Inv Obj: EF BAL/ACTIVE/CONSTRAINED/(EM) – 60.0% Equity AddV MV: 343,173 Fee Projection: 4,860
 Auth: SOLE FDx MV: 343,173 Fees Taken: 4,680
 From 8/23/2016 through 7/24/2017

SOLE TRUSTEE UNDER AGMT-IRREV Accounts: 1 Sleeves: 21 [REDACTED]

FDx Mkt Val	% FDx	Security Asset Class	FDx Mkt Val	% FDx	FDx Sleeve Asset Class	FDx Mkt Val	Inv Strategy	Port %	Mod %	Hldqs	Mod Hld
4,531	1.3%	FDX Cash	127,432	37.1%	Equity--Dom					0	
201,592	58.7%	Equity	49,220	14.3%	Equity--Int'l						
137,050	39.9%	Fixed Income	14,245	4.2%	Equity--Emerging Mkts						
			10,717	3.1%	Equity--Global						
			137,074	39.9%	Fixed Income						
			4,485	1.3%	OTHER						

[REDACTED] **[REDACTED]** **[REDACTED]** **DIANE [REDACTED]**

Inv Obj: 5 EQUITY EMPHASIS (TX) – 60.0% Equity, Taxable Fxd AddV MV: 2,531,355 Fee Projection: 27,948
 Auth: SOLE FDx MV: 2,531,250 Fees Taken: 27,294
 From 8/5/2016 through 7/10/2017

SOLE TRUSTEE UNDER WILL Accounts: 4 Sleeves: 7 [REDACTED]

FDx Mkt Val	% FDx	Security Asset Class	FDx Mkt Val	% FDx	FDx Sleeve Asset Class	FDx Mkt Val	Inv Strategy	Port %	Mod %	Hldqs	Mod Hld
26,823	1.1%	FDX Cash	953,442	37.7%	Equity--Dom	26,823	FDX Cash	1.1%	1.0%	4	
1,381,055	54.6%	Equity	452,427	17.9%	Equity--Int'l	691,337	LARGE CAP	27.3%	27.6%	35	35
121,401	4.8%	Balanced	1,003,253	39.6%	Fixed Income	146,464	MID CAP	5.8%	6.0%	40	40
1,001,971	39.6%	Fixed Income	121,401	4.8%	Alternative	90,826	SMALL CAP FDS	3.6%	3.6%	2	2
			726	0.0%	OTHER	452,427	INTERNATIONAL FDS	17.9%	18.0%	3	3
						121,401	ALTERNATIVE INV FDS	4.8%	4.8%	1	1
						1,001,971	TAXABLE INCOME	39.6%		38	38

April 25, 2018

Questions?

Data Analytics / Predictive Analysis **Investment Considerations**

James G. Hughes, SVP
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BB&T Retirement & Institutional Services



Retirement and
Institutional Services