XBRL and Data Analysis

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Analyzing XBRL Data

- What differentiates XBRL?
- The fundamental kinds of analysis
- Pre-processing XBRL

What differentiates XBRL?

- Depth
  - Fine grained base taxonomy
  - Extension taxonomies
  - Still need several more years of time series data
- Scope
  - All filers
- Variety
  - 10-K, -Q, Form SD, FDIC, other regulators, extensions

Fundamental types of analysis

Instance document data

- Conceptual consistency
  - Example – ‘risk free rate’
- Reporting consistency
  - Same data point reported multiple times across filings
  - Can change due to restatement, slipstreaming accounting change
- Time series
  - Not enough data yet
  - Impeded by element switching, renaming in taxonomies
- Unit analysis
  - Dimension analysis

Fundamental types of analysis

Instance document data

- Ratio analysis
  - Example – Altman Z-score
- Peer group analysis
  - Industry benchmarking
- Accounting policy change analysis
  - Example – lease accounting
- Text mining
  - “Unexpected”
  - Footnote specific searching

Fundamental types of analysis

Taxonomy data

- Period-to-period consistency
  - Example – element naming
- Usage ratios
  - Primary items
  - Dimensions
- Disclosure structure
  - ‘height’ of extensions
  - Label content

Pre-processing XBRL

- Recreating CompuStat
  - But with traceability
- Pivoting data
  - Coalescing similar concepts
  - Using presentation and calculation when lacking definition clues
- Denormalizing the data
  - Classic tradeoff of operational vs analytic database design
  - Textual facts separated and indexed

Why financial analysis at all?

- Asset class allocation is critical to portfolio returns
  - Stocks outperform all other asset classes over periods longer than 5 years
    - Ibbotson SBBI data
  - Broader stock indexes outperform managers
    - The broader the better
    - At the cost of volatility
- But closer than 5 years, you need analysis

XBRL improvements over the current state

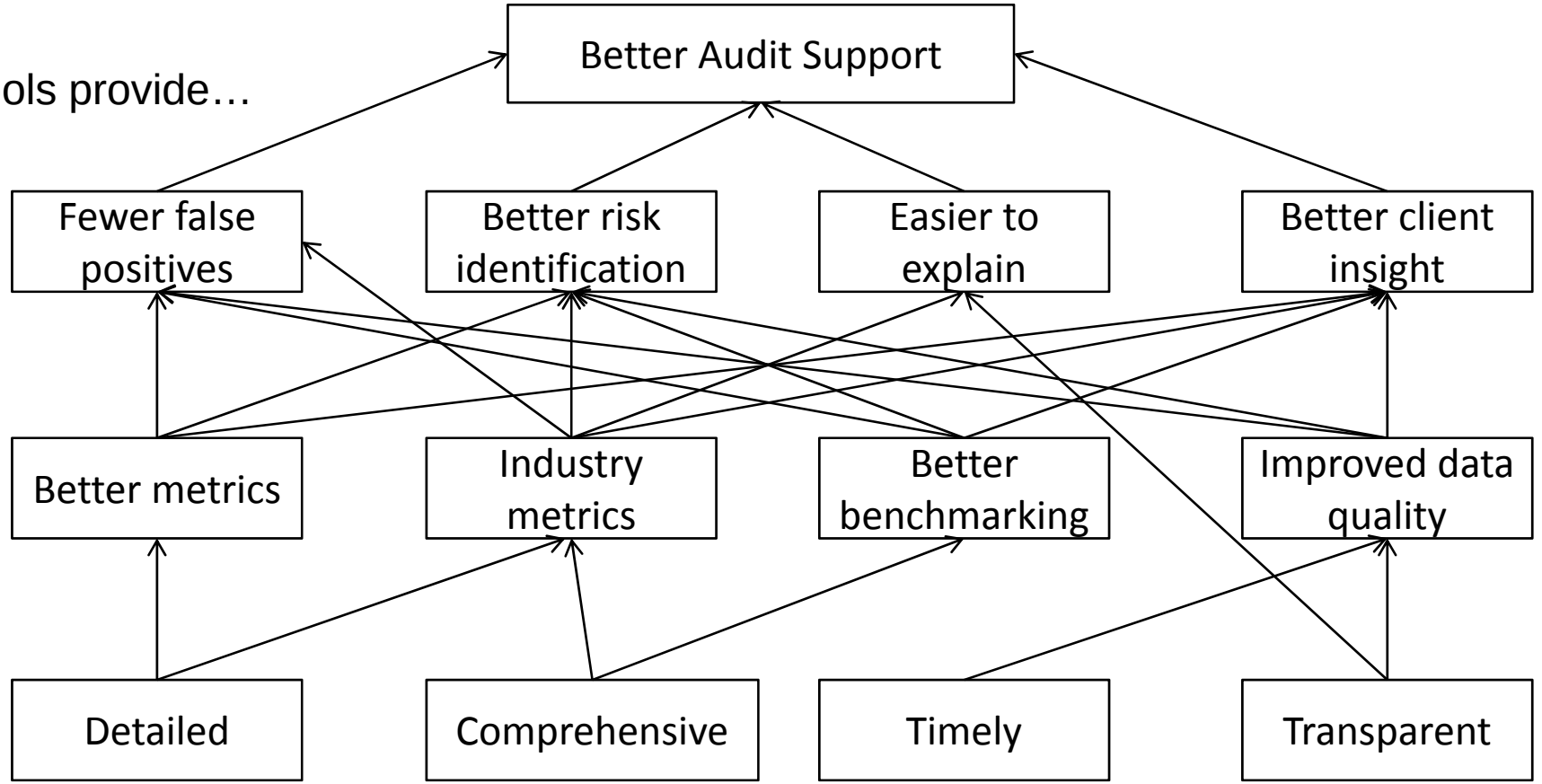
Using XBRL data does not change the audit methodology or the tools we use today. It enables the tools to be more targeted and powerful.

- Better metrics
- Industry specific metrics
- Better benchmarking choices
- Improved data quality

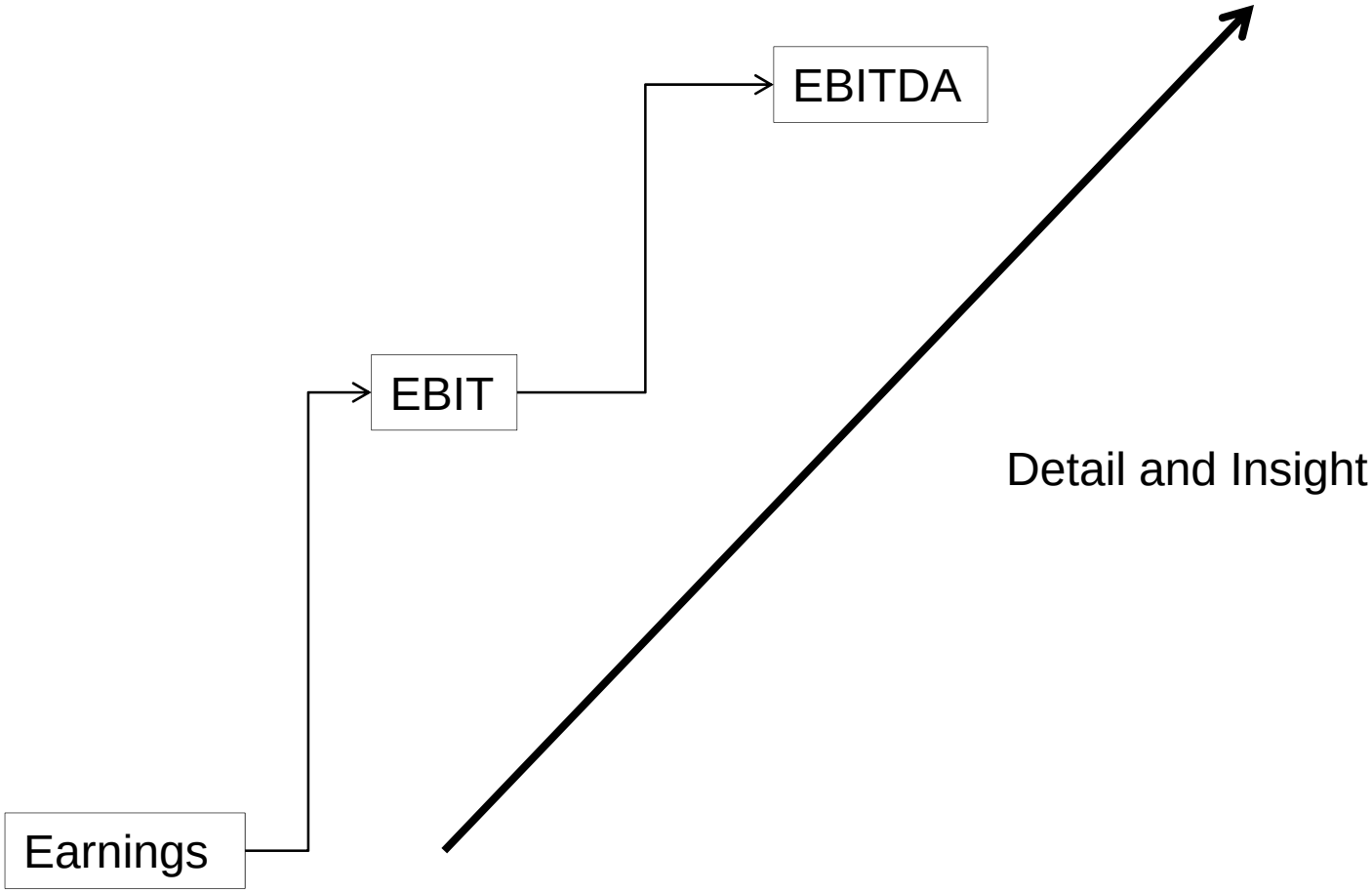
As tools become more targeted and powerful, the audit benefits by

- Fewer false positives
- Better risk identification
- Easier to explain to the client
- Better insight into the client

Value Network: XBRL to the Audit



Detail Drives Better Metrics



Opportunities for more detail

Trade receivables, net of allowances

Total Liabilities

Minority Interest

Other receivables

Net Fixed Assets

Current Liabilities

Sales

Depreciation Expense

Long-Term Debt

Inventories, net of allowances

Income Tax Provision

Capitalized Leases

Total operating expenses

Total Outstanding Shares

SG&A expenses

Deferred Taxes and Investment Tax Credits

Depreciation & Amortization expenses

Retained Earnings

Common Shares Outstanding

Long-Term Return on Pension Plan Assets

Total Assets

Capital Expenditures

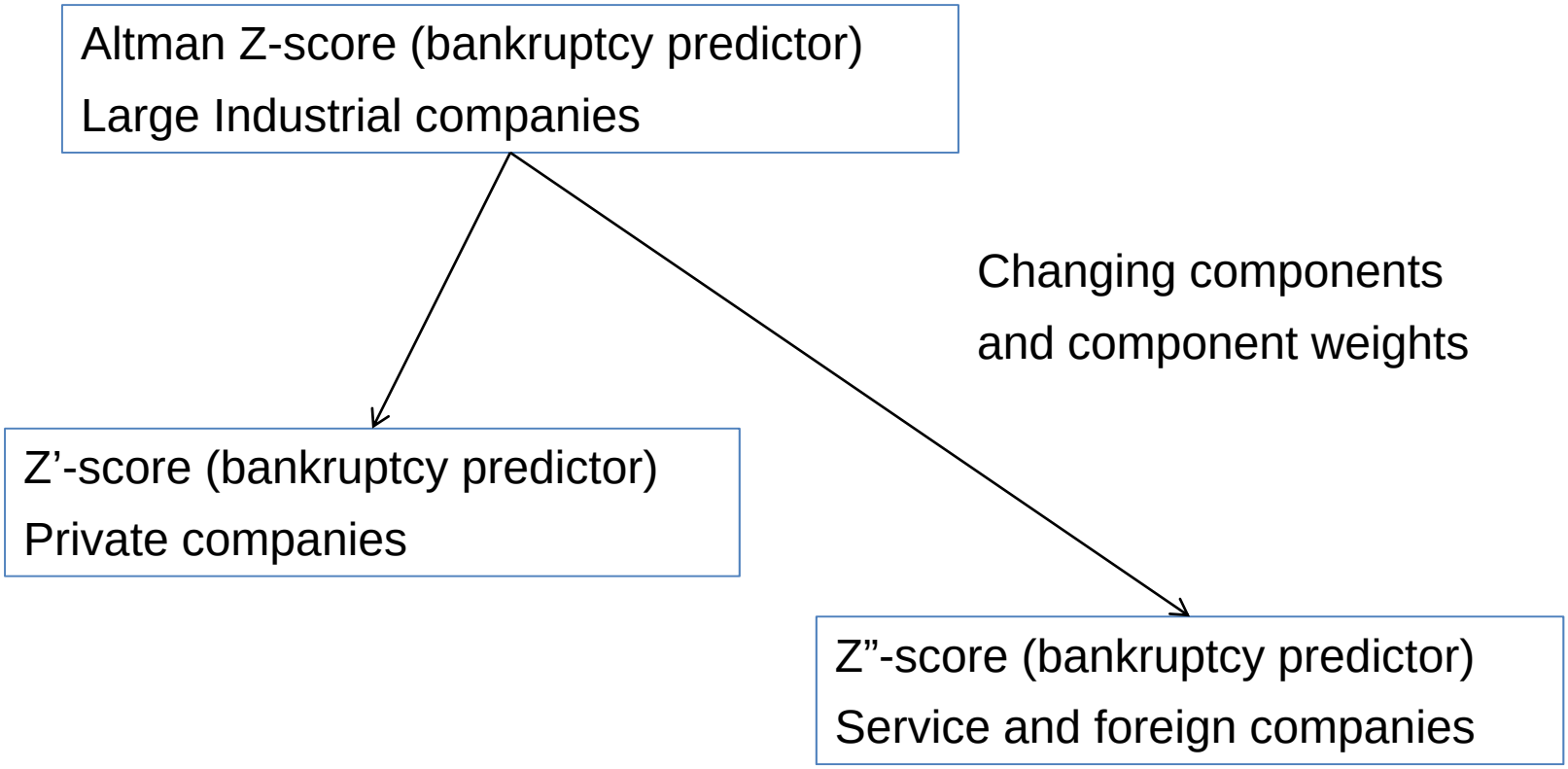
Income Before Extraordinary Items

Current Assets

Cash From Operating Activities

EPS Diluted Before Extraordinary Items and Disc Ops

Industry specific metrics provide better insight



XBRL data is more detailed and industry specific, enabling new industry specific metrics in tools.

Classical financial ratio analysis

- Altman Z-score
  - Bankruptcy predictor
  - Weighted sum of 5 ratios
- Z‘ score estimated for private firms
  - T_1 = (Current Assets − Current Liabilities) / Total Assets
  - T_2 = Retained Earnings / Total Assets
  - T_3 = Earnings Before Interest and Taxes / Total Assets
  - T_4 = Book Value of Equity / Total Liabilities
  - T_5 = Sales/ Total Assets
- Z' Score Bankruptcy Model:
  - $Z' = 0.717T_1 + 0.847T_2 + 3.107T_3 + 0.420T_4 + 0.998T_5$
- Zones of Discrimination:
  - $Z' > 2.9$ -“Safe” Zone
  - $1.23 < Z' < 2.9$ -“Grey” Zone
  - $Z' < 1.23$ -“Distress” Zone

Concepts used

- Balance Sheet
  - Current Assets
  - Total Assets
  - Current Liabilities
  - Total Liabilities
  - Retained Earnings
  - Common Stock, Value
- Income Statement
  - Sales
  - EBIT

XBRL data prep

- Capture XBRL files via EDGAR RSS
- Load into SQL database (XBRL US)
- Database schema maps to XBRL model
  - Not optimal for analysis!

From

Entity	Date	Concept	Value
IBM	201x	Assets	7
IBM	201x	Liabilities	4
IBM	201x	Equity	3
MSFT	201x	Assets	9
MSFT	201x	Liabilities	3
MSFT	201x	Equity	6

Even this hides the complexity of joining 5 tables for each fact!

To

Entity	Date	Assets	Liabilities	Equity
IBM	201x	7	4	3
MSFT	201x	9	3	6

Vast improvement

- Can calculate ratios easily in SQL SELECT
- Easily understood by most analysts, programmers

Fact table changes

- Separate base, numeric facts
  - These are the facts used in ratios today
- Subsets
  - Instant in context
    - Balance sheet items
  - Period in context
    - Income statement items
    - Annual period
    - Quarterly period

```
use xbrldb

-- create a subset of the fact table
-- in a base context (no dimensions)
-- numeric facts only (no text, dates)

drop table TempDB..base_numeric_13xx;

select f.*
into TempDB..base_numeric_13xx
from
        fact f
        join element e on e.element_id = f.element_id
        join context c on c.context_id = f.context_id
        join accession a on a.accession_id = f.accession_id
where
        c.specifies_dimensions = 0
        and
        e.is_numeric = 1
        and
        a.standard_industrial_classification in ( 1311, 1381, 1382, 1389)
;
```

```
drop table TempDB..base_numeric_13xx_instant;

select f.*
into TempDB..base_numeric_13xx_instant
from
        TempDB..base_numeric_13xx f
        join context c on c.context_id = f.context_id
where
        c.period_instant is not NULL
;

drop table TempDB..base_numeric_13xx_period;

select f.*
into TempDB..base_numeric_13xx_period
from
        TempDB..base_numeric_13xx f
        join context c on c.context_id = f.context_id
where
        c.period_instant is NULL
;
```

```
drop table TempDB..context_base_numeric_13xx_period;

select distinct c.*, datediff(d, c.period_start, c.period_end) as diff
into TempDB..context_base_numeric_13xx_period
from
        TempDB..base_numeric_13xx_period f
        join context c on c.context_id = f.context_id
;

select c.diff, COUNT(*)
from
        TempDB..context_base_numeric_13xx_period c
group by c.diff
order by c.diff
;
```

```
drop table TempDB..context_base_numeric_13xx_period_quarterly;

select f.*
into TempDB..base_numeric_13xx_period_quarterly
from
	TempDB..base_numeric_13xx_period f
	join TempDB..context_base_numeric_13xx_period c on c.context_id = f.context_id
where
	c.diff >= 89
	and
	c.diff <= 92
;
drop table TempDB..context_base_numeric_13xx_period_annual;

select f.*
into TempDB..base_numeric_13xx_period_annual
from
	TempDB..base_numeric_13xx_period f
	join TempDB..context_base_numeric_13xx_period c on c.context_id = f.context_id
where
	c.diff >= 364
	and
	c.diff <= 367
;
```

Important next steps

- What is the most recent version of a fact?
  - Same fact is reported across multiple filings
- Coalesce uses of different concepts
  - Revenue vs Oil Revenue vs …

```
select	f.element_id, c.period_instant, c.entity_identifier, count(*) as count
from
		TempDB..base_numeric_13xx_instant f
		join context c on c.context_id = f.context_id
group by f.element_id, c.period_instant, c.entity_identifier
having count(*) > 1
;
```

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