



# Data driven cash forecasting



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# 01: What is data driven?

Data driven is a bit of a cliché but we frame it quite simply - a data driven process is one where data does most of the work and provides most of the answers.

Data driven cash flow forecasting gives you the insight you need into your future cash flow using the data you already have available in your organisation.

By minimizing manual effort and focusing instead on analysis, a data driven approach will transform the way you forecast and manage cash flow.

## 01.1: Key forecasting sources

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### BANK

Bank portals and electronic bank account statements (e.g. MT940, BAI2) are a key source of actual balance and transaction detail used to populate the forecast model and for variance analysis.

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### ERP

ERP systems contain AP and AR data used to create short term forecasts. The ERP can also be used as the source of actual cash flow data and in some instances will contain longer term planning data.

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### BUDGET

The annual budget can be used as the baseline for medium to longer term cash forecasting while providing the entire forecast for recurring items such as payroll and rent.

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### OTHER

A range of other systems and data sources can flow into the cash flow forecast such as CRMs which may contain early stage invoice data and treasury management systems with financing flows.

# 01.1: Key forecasting sources, continued

## Data sources

A cash flow forecast is simply a collection of data from other systems with input and adjustment from the forecaster. Start with the data sources that contain the most up to date and important data and build from there. A cash forecast can be built using some or all of the following data sources and inputs.

- Bank
- ERP Ledger
- Budget
- Forecaster Input
- Treasury Management System

## Automation opportunities

A data driven cash flow forecasting process is typically one that is highly automated. 100% automation is not required to be data-driven, however, to put a sustainable data driven process in place, the data heavy lifting and analysis should be automated.



Statistical Forecasting



Business Intelligence



Robotic Process Automation



File Transfer Protocol



Application Programming Interface



Artificial Intelligence



Spreadsheets



Machine Learning

Activities	Description	Technologies
<b>Data Capture &amp; Loading</b>	Capturing the underlying cash flow data is the first stage in any cash flow forecasting process. This means taking the cash flow data from the source system or database and loading into the forecasting tool or system.	API RPA SFTP/ FTP
<b>Transformation &amp; Organisation</b>	Next up is transforming and organising the underlying data to make it useful for forecasting and analysis. This can cover a range of activities including data cleansing, classification and restructuring.	RPA ML AI
<b>Forecast Creation</b>	With the data in place, it's time to create the forecast itself. This involves taking the cash flow data building the forecast using a method such as the ledger unwind or trend forecasting using historical data.	RPA AI ML Stats SS
<b>Reporting &amp; Analysis</b>	Making the forecasts understandable and discoverable via intuitive reporting with back-up analytics is the final critical stage in any forecasting process. If the forecast isn't easy to understand, it won't be valuable.	RPA AI ML Stats SS

# 02: Introduction to data driven cash forecasting

## 02.1: Actual cash flow data

Actual cash flow data is a critical, yet often overlooked, part of any cash flow forecasting process. The balance and transactional data, most frequently sourced from ERP systems and bank statements, allows you to “actualize” the cash flow model on an ongoing basis which provides a range of benefits, including:

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### ANALYSIS OF RECENT PAST

Understanding what has happened with cash flow in the recent past is essential ahead of attempting to build a picture of the future.

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### VARIANCE ANALYSIS

Actual versus forecast analysis is a central part of any high value forecasting process which is reliant on up to date actual cash flow data.

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### BUILDING CURRENT POSITIONS

Actual cash flow and balance data is used to calculate current cash and liquidity positions which is the starting point of any forecast.

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### TREND FORECASTING

Any trend forecasting model or algorithm will require historical actual cash flow data that is frequently refreshed to create accurate forecasts.

## 02.2: Sources & Considerations

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### Bank accounts

Bank account statements are the primary source of cash flow data for any purpose, including cash flow forecasting. These statements data can be accessible via online banking portals and downloaded in multiple different formats, depending on the bank. Bank account transaction and balance can also be captured automatically from a bank using a variety of different connectivity options including API and SFTP in a range of different formats (MT940, BAI2 etc.).

#### ★ PROS

- Bank account data can be refreshed in real time
- Bank account data comes in standardised formats like MT940 and BAI2

#### 🚫 CONS

- Sometimes reference detail isn't available to make classification easy (e.g. a customer's name)
- It needs to be classified to make it useful

### ERP Ledger

Every transaction from a bank account is loaded into a company's ERP system and assigned to an outstanding invoice or allocated to a specific account during the bank reconciliation process. Therefore, following this reconciliation process this actual data is also useful for actualising the forecast model. Each company will have their own connectivity processes around their ERP however, similar to connecting to a bank, it will most likely be via API or SFTP.

#### ★ PROS

- The transaction data comes pre-classified
- No reliance on any external parties (e.g. banks) for the data
- It can be used for detailed customer, supplier and working capital analysis

#### 🚫 CONS

- There may be a time lag due to the reconciliation process
- The raw export may need to be tidied up before use

## 02.3: Which to use

This really comes down to the use case of the forecast and the amount of detail needed for reporting and decision making purposes. For example, if the forecast is used for treasury liquidity forecasting only, focused on tracking net cash movements and positions, capturing the data from the bank will suffice.

On the other hand, if the forecast is used to support working capital and free cash flow reporting and analysis, the ERP ledger would be the best source of data due to the fact it is pre-classified and therefore more useful for analysis purposes.

## 02.4: AP & AR ledger data

AP and AR ledger data, typically sourced from an ERP system, is an essential component of a short term forecast. This ledger data, comprising both outstanding and paid invoices, helps build a picture of what cash the business is likely to receive from customers and pay to suppliers in the coming days and weeks.

The AP and AR ledger data will help build the operating cash flow forecast for up to six weeks into the future, dependent on the payment terms offered to customers and received from suppliers.

### Where and how to source data

Ledger and invoice data are more often than not sourced from the ERP system although increasingly, dependent on the database infrastructure in the business, it can also be sourced from data warehouses or data lakes.

There are a number of ways to get the invoice data out of the ERP, but this again depends on the business itself. If being used for manual analysis or the manual update of a forecast model, a standard outstanding and cleared invoice report will suffice. To automate the transfer of data on an ongoing basis, it will be necessary to involve I.T. in what, in all likelihood, will be a mini-project.

### What data is needed

In order to build and drive a short term cash flow forecast using ledger data, two data sets across both AP and AR will be needed: Outstanding AP & AR and Cleared/Paid AP & AR.

### Outstanding AP & AR

This is essentially a list of unpaid AP and AR invoices sitting on the balance sheet/ in the ledger. As standard, the invoice data extract will need to contain:

- Document number
- Document type
- Document date
- Customer/ supplier name or ID
- Due date of invoice
- Amount
- Currency

With this information a baseline customer and supplier level forecast can be created.

### Cleared/paid AP & AR

The cleared or paid AP and AR data is used to understand what has been paid since the last forecast and, in some cases, is needed to net off against the original invoice amount to calculate outstanding balances. In addition to the field outlined above, the following fields will be required:

- Payment date
- Connected invoice ref (if netting required)

## 02.3: What to watch out for

Sometimes the data exported from the ledger may not translate into a meaningful cash flow forecast on the first iteration. This is because the dataset may need to be organised and transformed ahead of forecasting. This sounds daunting but often boils down to doing a few things:

### Cleansing data set

Remove any non-cash items or irrelevant invoices ahead of forecasting.

### Account for document type

Often the ledger will contain a number of document types alongside the standard invoice. These document types will all have a different impact from a cash flow point of view and must be accounted for within the forecast model. The simplest example is a credit note which has the effect of reducing the amount of an expected invoice. It will be difficult to calculate an outstanding customer or supplier balance without first taking account of credit notes. Most large companies will have a variety of document types and adjustments that impact invoice balance and therefore cash flow.

# 03: Cash forecasting techniques & methods

**Cash forecasting** is the process of figuring out what cash will go in and out of a business over a period of time with the ultimate goal of understanding what excess cash is available or when a cash shortfall will occur.

In a business, of even mediocre complexity, the process of cash forecasting will involve planning and predicting a variety of different types of cash flow from receipts expected from customers, to tax payments due to the government.

Unfortunately, there is no one size fits all approach to forecasting in most companies as the process of predicting one type of cash flow is very different to predicting that of another. Using the example above, forecasting customer receipts is very different to forecasting tax payments.

Other factors such as the underlying business model and how far into the future the forecast extends will also determine what forecasting methods and techniques should be used.

Luckily, however, by mapping out the forecast and analysing it in the context of the business, it's requirements and the availability of things like data, you will quickly be able to determine what forecasting methods should be used to produce the most realistic and accurate output.

This short guide talks through what to consider before the forecasting methods are chosen and discusses some of the most common methods for forecasting cash flow.

## 03.1: Upfront considerations

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Ahead of attempting to select a forecasting method and build the forecast itself, there are some important things to consider upfront.

### Cash flow category

The first step in building any forecast is to understand the nature of and the drivers behind the type of cash flow you are trying to predict and ultimately where data needed to forecast can be sourced.

For example, in most businesses, the key driver of cash flow is topline receipts from customers. Everything else ultimately flows from this. If customers don't pay, we won't be able to pay. Or, at the very least, if we can't predict when they will pay, it will be difficult to predict what cash we will have in the future and ultimately what cash can be paid out to meet obligations.

Therefore, as a starting point it is critical to map out your key categories of cash flow and understand in as much detail the dynamics of each. Cash forecasts are typically created at a "management reporting" level of detail and some of the most widely used cash flow categories are:

- Customer receipts/ Cash revenue
- Supplier payments and other non salary cost of goods
- Salaries and compensation
- Rent and facilities
- Capital expenditure
- Tax
- Interest and debt payments

## 03.1: Upfront considerations, continued

### Business model

A company's business model will have a huge influence on what method of forecasting is chosen for each cash flow category. For example, a company that sells heavy machinery to other large businesses will have a very different method for forecasting customer receipts to an ecommerce company.

However, while customer collection forecasting in these two businesses is different, there may be similarities in other areas of the forecast, particularly if they both buy raw materials or goods from other large companies. In this case, how they forecast supplier outgoing payments could look quite similar.

Other business model considerations include the payment behaviour and requirements of your largest customers and suppliers, particularly if certain customers or suppliers account for large percentages of cash flow.

Leading on from this, your company's attitude to the extension of credit to customers and under what terms will influence how the forecast is created and what method is used.

### Forecast time period & granularity

The granularity and time period of the forecast will also influence the forecasting method chosen with different methods often required for short and long term forecasting for the same cash flow category.

Building, as an example, a daily forecast for supplier payments for the next 30 days is very different to forecasting supplier payments in the nine to 12 month period. Trying to use a single method to do both won't provide satisfactory results.

Knowing what granularity to forecast at and to what period in time also requires a judgement call driven by the trade off between effort and output. Everyone would like as much granularity as possible but is a daily forecast for a year really necessary? How would having this level of detail help and could we instead reduce the granularity in the longer end of the curve and therefore reduce the effort invested?

## 03.2: Forecasting methods

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Depending on your perspective, the number of forecasting methods available could be infinite. When the broad range of statistical, demand, driver and AI/ML forecasting techniques are considered, it can be difficult to know where to start.

However, in our experience, when forecasting cash flow, a handful of techniques, when mastered and adapted to the business in question, can cover most bases.

- Ledger unwind
- Budget modelling
- Statistical/ trend forecasting
- Driver based modelling

### Ledger unwind

The Ledger Unwind is the process of taking an accounts payable or accounts receivable ledger, with all of the outstanding invoices it contains, and “unwinding” it to points in the future based on the expected payment and receipt dates of the invoices.

The forecasting element of this process comes down to determining the expected payment and receipt date of the invoices. This can be driven solely by the terms of the invoice or can be based on another method such as analysing historical payment behavior.

The Ledger Unwind method of forecasting is very much dependent on being able to capture the necessary data from the underlying ERP system.

With regards to the assumptions applied to the invoices to give them more realistic receipt dates, in the case of customer collection forecasting, as an example, profiling the historic payment behavior of clients and using this as the basis for predicting cash receipts is often a good starting point. Once the basic assumption is in place, it can be tweaked and iterated over time.

The key benefit of the Ledger Unwind is that the forecast and subsequent variance analysis can be backed out, as a starting point, to a customer and supplier level of details with recourse all the way through to the underlying invoice. For any company looking to build not just an accurate forecast but also to understand what is driving their short term cash flow, this method of forecasting is a must.

The Ledger Unwind is suitable in the following situations.

- Operational cash flow categories such as customer receipts and supplier payments
- Short term forecasting, typically 0 - 6 weeks into the future
- Business-to-business type business models with outstanding invoices of sizable value



## 03.2: Forecasting methods, continued

### Budget - modelling & direct items

The budget is the main source of financial planning intelligence within any business. It projects all income statement and balance sheet items a number of years into the future. The FP&A team will create the budget on an annual basis and refresh it at least once during the year.

The budget can be used to create a multi-year cash flow forecast by applying the indirect method which involves combining the income statement and balance sheet to derive the cash flow forecast/ projection. This method can be useful for creating a long term (one year plus) forecast but it's often not that helpful for forecasting short to medium term cash flow due to the fact that it doesn't have the short term granularity required for effective short term forecasting and also because it is only refreshed a couple of times a year. A short term forecast, by its very nature, requires a much more frequent refresh of data and assumptions to be effective.

However the budget, used in a slightly different way, can support short to medium term forecasting.

Again, this needs to be analysed on a per cash flow category basis but, as an example, taking the sales/ revenue budget for a medium term period of, say, six weeks to six months, and combining it with payment timing assumptions is a simple way to translate an income view into a cash flow view. This budget modelling exercise is often the best way to create a medium term cash flow forecast.

The budget can be translated one-to-one into the forecast for some cash flow categories without the need to apply any assumptions or do any data modelling. For example, stable and easily predictable items such as payroll and rent that aren't subject to credit terms, can simply be copied directly into the cash flow forecast. Depending on the granularity of the forecast, they may need to be manipulated slightly to take quarterly or monthly numbers and translate them into a daily or weekly view.

In summary, the budget is useful for forecasting the following:

- Medium term sales and cost of goods items.
- Short, medium and long term fixed items that aren't subject to credit terms.

### Statistical & trend forecasting



Most statistical and trend forecasting methods and techniques combine historic data with mathematical models to predict data points in the future.

The amount of data required to forecast in this way is very much dependent on the variable you are forecasting and the amount of historic data available for this variable. For example, if you are forecasting customer cash collections for the next 13 weeks, capturing an expected seasonal trend, it is likely a number of year's worth of data will be required so that the model can learn from similar historic periods.

Covid-19 has called into question the use of trend forecasting methods and techniques, particularly where a business has been impacted in a profoundly positive or negative way. Using a historic data set that covers the period of most volatility in 2020, is unlikely to produce a useful trend forecast, regardless of the model used. However, as the economy normalises and businesses attempt to look through the impact of Covid, the use of historic data to build trend models becomes viable again, particularly for businesses that benefit from shorter term trends (week-on-week, month-on-month etc.)

Of course, statistical forecasting is about more than extrapolating a historical trend but trend forecasting is one of the techniques most relevant to cash forecasting. Some useful statistical forecasting models include:

#### NAIVE

A naive model is the simplest of all forecasting methods as it simply rolls historic data into a future period. It may not seem that sophisticated or intelligent in its own right however it can be an excellent baseline to which assumptions can be applied and for comparison versus more involved methods to test their credentials.

#### MOVING AVERAGE

This is a time series technique that takes the average of a historic data set, or periods within the data set, and uses these as the basis for the forecast. The moving average calculation can vary in complexity from simple moving average which treats all historic data points equally to weighted and exponential moving averages which weight more recent data more heavily within the model.

#### LINEAR TREND

A linear trend model takes a historic data set and "fits" a line that best represents the behaviour the model can see in the data with this line then becoming the forecast which represents the historic trend.

#### OTHER TIME SERIES

A number of other time series methods exist, notably ARIMA and Exponential Smoothing. Both of these techniques fit trend lines to data sets and use these as the basis for the forecast but are used in different ways in different types of data sets.

As with all of the other forecasting techniques it is critical to understand the nature of the data and the type of forecast being built ahead of selecting a statistical forecasting method. However, in summary, trend and statistical models should be used when:

- The past behaviour of a cash flow line item is representative of expected future behaviour.
- A meaningful amount of data is available to allow the model to learn from past trends.

## 03.2: Forecasting methods, continued

### Driver based forecasting

Driver Based Forecasting is another very broad area and one that ties in very closely to the area of trend and statistical forecasting discussed above. In a driver based model, the relationship between two variables is analysed and the forecast of one variable is then used to “drive” the prediction of another variable.

A simple example is using a revenue forecast in combination with expected future gross margins to forecast expected cost of goods expense. Similarly, driver based forecasting is particularly valuable to industries with exposure to and reliance on a number of key input costs such as oil or other commodity prices. In this case, a forecast of input volume required combined with an expectation of the commodity price will in turn produce a forecast of the required input cost. The input volume itself could be driven by the expected demand for the company’s product. Therefore driver based forecasting is often multi-layered.

Driver based forecasting is particularly useful for scenario analysis as changing the input variables, such as volume or price in this example, will cause a subsequent change in expected input cost (if oil goes up by X, our costs go up by Y).

A number of key line items in the cash forecast can be drivers for other parts of the forecast. So while all of your forecast may not be driver based, some parts of it will be.

Driver based forecasting is useful when:

- There is an established relationship between two cash flow line items or another non-cash flow input (eg. the price of oil).
- The variables used to drive the forecast can themselves be forecast with a reasonable degree of accuracy.

# About GTreasury

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