Topic 14: Short-Term Finance/Working Capital

Our final unit involves *short-term* financial management. Earlier chapters have focused primarily on *long-term* financial management issues: obtaining money from long-term sources (bondholders and stockholders) and investing it in long-term projects (analyzed with our *capital budgeting* tools). Long-term issues traditionally have claimed the lion's share of coverage in general financial management courses. Long-term assets are the ones that distinguish the firm's activities (is it a steel mill or a pizza parlor?), and the ones on which the firm earns its greatest returns. If we think of assets as bad (from one viewpoint) in general, then we should view *current* (short-term) assets as especially bad.

As we will see, however, a company can earn returns on its current assets as well, especially its accounts receivable. Yet perhaps of more concern is the high cost that short-term assets (cash, inventory) and short-term liabilities (accounts payable) can impose. Recall that an issue in financial statement analysis is the tradeoff between liquidity (current assets let you generate cash quickly) and profitability (liquid short-term assets can be a profitability drain). In this unit we consider some of these returns and costs, along with planning for our short-term financing needs.

I. Working Capital: Definitions and Issues

Note that current assets are called *working capital* or, sometimes, *gross working capital*. Current assets minus current liabilities is called *net working capital*.

A company can take a flexible, moderate, or restrictive approach to current asset holdings. A flexible approach involves holding a greater quantity of gross working capital, including high levels of accounts receivable and inventory; this approach serves to encourage more sales but also imposes greater costs (investors must be compensated for their money tied up in receivables and inventory, and we must pay suppliers of labor and material *more* if we must pay them *later* in response to our own customers' paying us later). A restrictive approach involves holding a lesser amount of working capital, perhaps even down to a target level of zero; this approach holds costs in check but could reduce sales, especially if the product market is uncertain and holding too little in current assets reduces needed flexibility. A moderate approach falls somewhere in between. Our goal should be to trade off the promotion of sales against the reduction in needed assets, in a manner that maximizes the value of the firm.

II. Operating Cycle and Cash (or Cash Conversion) Cycle

To plan our needs for short-term financing, we must know the time period over which financing is needed. This period is determined by how long it takes us to collect cash from our customers.

We start with our *operating cycle*: the time that passes from the day when we bring raw materials into inventory until the day when we receive a check from the customer. If we take possession of $100,000 in inventory (and have to pay for it) on day 0, but do not collect from our customers until day 90, then we must obtain 90 days' worth of financing in the amount of $100,000. On day 90 we expect our customers to pay us $100,000, plus a profit on top of the $100,000.

This 90-day operating cycle might be broken into two major components: the *inventory* (or *inventory conversion*) *period* (how long it takes for raw materials to be converted into salable goods and sold) and the *receivable* (or *receivable collection*) *period* (how long it takes for us to collect cash from the buyers of the goods, once the finished goods have been sold).

So perhaps we take delivery of raw materials on day 0, we complete the production process and sell the goods by day 40 (a 40-day inventory conversion period), and then it takes an average of another 50 days for us to collect from customers (a 50-day receivable collection period). So our operating cycle is 90 days. (Obviously we would have to compute some things differently for a service-oriented business; for example, the operating cycle might be defined largely by the receivable collection period.)

But do we really need 90 days' worth of financing? What if we do not have to pay *our* suppliers until day 30 (a 30-day *payables, or payables deferral, period*)? Then we need financing from day 30 until day 90: a 60 day *cash* (or *cash conversion*) *cycle* (the time our own money is tied up in other current assets – inventory and then accounts receivable – before being converted to cash). We can compute the cash conversion cycle as the operating cycle minus the payables deferral period: here it is 90 days – 30 days = 60 days.

Because a longer cash (cash conversion) cycle indicates a greater need for financing of short-term assets, there can be benefits to shortening the cash conversion cycle. We shorten it by reducing the inventory conversion period (producing more quickly and/or selling finished goods with less delay), reducing the receivable collection period (getting customers to pay us more quickly), or lengthening the payables deferral period (delaying our own payments to suppliers of labor, materials, *etc*.).

However, it should not be surprising that there are costs to doing these things, so the goal should be minimizing the costs – as broadly defined – of managing the current assets and liabilities. For example, a cost of producing more quickly might be paying overtime wages. A cost of paying less quickly might be giving up the chance to pay the discounted prices that often accompany timely payment. The ethically questionable practice of delaying payment beyond the final stated due date may carry no added immediate *explicit* cost, but over the longer run it can cost the firm its reputation, and ultimately impose costs ranging from lost flexibility to lawsuits.

III. Cash & Marketable Securities Management

Famous (and long dead) economist John Maynard Keynes and others have taught that both households and businesses hold cash for a variety of reasons:

- transactions (which relate to the amounts and uncertainties of cash inflows and outflows from operations, to our holding of near-cash securities, and to our ability to borrow in a pinch, because we ultimately need cash to settle our transactions)
- precaution & speculation (holding cash for emergencies or to invest when rates of return rise)
- meeting *compensating balance* requirements imposed by lenders

Over time the precautionary and speculative reasons for holding cash have largely been eroded, through more efficient methods of borrowing when needed, and through the buying/selling of marketable securities to allow our most liquid assets to earn some interest. And banks' use of compensating balance requirements has largely disappeared. But in any case, it is essential that we ultimately have sufficient access to cash (which we define as a balance in a checking account that pays essentially no interest), while not holding more than necessary. Cash management is often a joint effort between a firm and the bank(s) at which it holds transaction accounts.

Marketable securities would tend to be short-term bonds issued by businesses or government agencies. A company holding marketable securities could be concerned with several categories of risk:

- Default risk: concern over whether the borrower can repay the amount borrowed, plus applicable interest, in full and in a timely manner.
- Maturity risk: the values of longer-term fixed income securities change more dramatically as market interest rate change than do shorter-term fixed income securities.
- Liquidity or marketability risk: if the market for the security is not sufficiently large and active, the holder could find it difficult to sell the security quickly and without high transaction costs or lost value.
- Income taxation: interest income received may be taxed at both the state and federal levels.

As the company moves its marketable securities holdings more toward shorter term bonds, it reduces maturity risk. As it moves more toward holding bonds issued by the U.S. federal government, it reduces default risk (the federal government has unquestioned ability to pay its debts), and liquidity/marketability risk (the government bond market is huge, and very active). It also may reduce its income tax bills, because interest income received on bonds issued by the federal government is not taxed at the state level.

Cash is our means of making timely payment, so that we can buy when prices are favorable, take advantage of trade discounts, and preserve our credit rating. The Internet allows for "real-time" payments, with instantaneous transfer from a buyer of goods or services to the seller through the Federal Reserve's "FedNow" system available since July of 2023. But a longstanding issue that continues to be of at least some concern in cash management is the use of *float*. Float is the time

lag between the day when a payee receives a check (and then can't complain about not having been paid) and the day when the payor's bank "clears" the check (deducts the money from the payor's account). Float exists because the banking system needs time for things to go through the mail and get processed (especially if the payor and payee are in different parts of the country, so that two different *Federal Reserve* banks are involved in the clearing process).

So if we know that it takes 3 days from the time our recipient receives a check until the money is deducted from our checking balance, and we write $100,000 worth of checks each day, then on an ongoing basis we do not need $300,000 of financing that we *would* need in the absence of float. If it costs 10% annually to obtain a $300,000 loan on an ongoing basis, then it could be argued that float is saving us $30,000 per year (10% of $300,000, or what we would otherwise have to pay for the ongoing use of $300,000 by borrowing it someplace). Stated differently, if we can increase float by one day we can save $10,000 per year.

But then look at the flip side: we receive checks from our customers and then can not complain that we have not been paid, yet the money is not really available to us for (let's say) 3 days; we might call this situation *negative* float. If we receive $100,000 of checks per day, then by reducing our customers' use of float by one day we also save $10,000 per year.

We might try to increase our positive float by looking for ways to delay the check clearing process – an activity that raises troubling ethical questions. Less ethically troubling would be looking for ways to reduce negative float (speed collections). One such method is the *lockbox* system, whereby we hire a bank in the part of the country where our customers are located to collect and clear checks locally (without going through the "Fed," and thus potentially slicing several days off the clearing process). If we do receive $100,000 in checks per day, and if using a lockbox system would reduce negative float by one day, then we would willingly pay up to $10,000 per year to our agent bank if other short-term financing would cost 10% annually.

The growing use of electronic payment systems like FedNow, and the ability of banks to use "fax" copies of checks in the clearing process (through the "Check 21" law passed in 2004), will increasingly reduce the use and importance of float, in both payments and collections. Indeed, if a firm sells primarily to other businesses it is likely to handle almost all of its collections through electronic means, such that float becomes essentially a non-issue. But even in late 2023 I still notice that it can take several days to show the increase in the receiving account's balance when I move money electronically between my brokerage account and bank.

IV. Meeting All Payments – The Cash Budget

In accounting classes you probably explored the *cash budget*, a tool for mapping out when all cash is expected to come in and when all payments are expected to be made. A cash budget typically is plotted for a year, broken down into monthly intervals (with more detailed weekly or even daily cash budgets sometimes prepared). The cash budget allows us to predict (based on experience, and on knowledge of the current state of the economy):

- when we will collect cash from our customers (usually during a month sometime after the goods are expected to be sold);
- when we will pay cash to our suppliers of labor, materials, utilities, money, *etc*.;
- when high payment months force us to borrow short-term until we can repay in a high collection month; and
- when we will repay our short-term borrowings (including interest).

The situation becomes complex because:
- customers who pay early typically receive trade discounts, so the benefit of collecting quickly can be offset somewhat by collecting less;
- some payments (income taxes, insurance) are made only 1 – 4 times per year, while others are made monthly; and
- a high payment month (maybe 30 days after receiving raw materials) is unlikely to correspond with a high collection month (maybe 30 days after having produced and sold finished goods). Indeed, a big part of cash budgeting is looking at past receivables *aging schedules* to see how many months pass, on average, after a sale before cash is collected.

Cash budgeting is more difficult if cash receipts and payments are not stable over time. The more unpredictable a firm's cash receipt and payment patterns, the more the managers must supplement cash budgeting and other cash management techniques with holding extra liquidity in the form of marketable securities, and with arranging standby *lines of credit* from banks. In fact, we can argue that a cash budget would not be needed if a firm's sales, collections, and payments were the same each month. In such a case, we would know whether the firm is solvent simply by looking to see whether a single month's collections exceed the month's payments.

V. Accounts Receivable Management

The receivables balance depends on the value of goods sold on credit each day and the number of days it takes the firm to collect from customers. These amounts depend, in turn, on the company's credit standards (how lenient or strict it is in granting credit to customers) and its collection policies (how lenient or strict it is with customers that do not pay when they are supposed to). Leniency can increase sales, but can also lead to opportunity losses (time value-based) and losses from uncollectible accounts.

When a sale is made, the balance sheet result is
- a reduction in inventory,
- the creation of an account receivable, and (if the sale is profitable)
- the creation of some retained earnings (which balances the amount by which the sale price – which is to say, the receivable – exceeds the cost of the goods sold).

A useful receivables management tool is the ratio known as days' sales in receivables, or days' sales outstanding (DSO), or average collection period (ACP):

$$\text{DSO or ACP} = \frac{\text{Accounts Receivable}}{\text{Annual Sales}/365}.$$

This ratio is the number of days it takes the firm, on average, to collect on its credit sales. If customers are expected to pay by day 30, yet the ACP is 40 days, the firm may need to be more forceful in its collection efforts. (Note that if the firm offers a cash discount for early payment, such as on day 10, and if some customers pay on day 10, then the ACP should be less than 30 days if day 30 is the final stated payment date. Note also that we would use 365 as the number of days in the year, unless the computed ratio were to be compared with a ratio published by some outside source that uses the traditional 360-day approach.)

As with cash and inventory, modern information management technology has improved companies' ability to monitor their receivables position, for example through aging schedules (a listing of the time periods over which various accounts have remained unpaid).

Finally, note that a customer that does not take a discount offered is paying a higher price that can be viewed, in effect, as an interest payment. This interest payment is a cost to the customer, and a potential source of income to the selling firm. However, this income is reduced to the extent that customers do not comply with the stated terms of trade – a topic we look at in detail in a later section of this unit.

VI. Inventory Management

The basic goals in inventory management are to maintain enough inventory to meet sales needs while keeping inventory low enough to prevent unnecessary holding costs (investors' money, storage, insurance, possible theft, possible spoilage or obsolescence). Inventory control systems can range from very simple (always reordering when the supply on hand falls to a pre-determined level, such as "we're down to half a bin") to complex computerized models that track each item of inventory as it moves through a production or sales process.

Many American firms have adopted Japanese-style "just-in-time" inventory systems, in which suppliers deliver needed items so frequently that essentially no inventory has to be held. Better planning, supported by better information technology, has permitted companies to reduce their inventories considerably, relative to what they had to hold in the past. Just-in-time works best if production is predictable; indeed, if production is erratic it becomes necessary for some party in the distribution chain to hold some inventory. (So the firm is simply passing the cost of holding, or "carrying," inventory to one or more of its suppliers – a desirable move if that party can more efficiently bear the inventory carrying cost.) Of course, the cost of managing inventory is simply one component of the overall cost of producing and distributing goods.

If we request a bigger shipment each time we place an order, then we do not have to place too many orders over the course of a year, but our average inventory – and our cost of carrying

inventory – will be quite high. If we place smaller orders, then we have to place more orders each year, but our average inventory – and our cost of carrying inventory – will be lower. Our goal is to find the right tradeoff between carrying cost per unit of inventory (if it is higher we will tend to go with more orders each year and a smaller average inventory) and the ordering cost (also called *transaction* or *shortage* cost; if it is higher we will tend to go with a higher average inventory, and fewer orders placed each year).

A traditional tool for finding the right tradeoff is the Economic Ordering Quantity, or *EOQ* model:

$$Q^* = EOQ = \sqrt[2]{\frac{2TF}{cc}}, \text{ in which}$$

Q^* is the number of units that should be ordered each time an order is placed. Q^* is a non-dollar value (the nature of which is specified in the context of the problem), because under the radical sign the dollars in the numerator and denominator cancel;
T is the total number of units of the inventory item purchased for use each year;
F is the cost of placing an order (we call it F because we treat it as *fixed* in amount regardless of the order size). Ordering costs can include phone charges, employees' time, and even setup charges if the supplier has to make the goods to our specifications; and
cc (sometimes represented as c or CC) is the dollar cost of carrying a unit in inventory for a year.

The 2 in the numerator relates to an underlying assumption that inventory is used *steadily* through the year, such that the *average* inventory (what is carried during the year) is always *half* of what is ordered each time (*i.e.*, inventory falls steadily from Q^* to 0, and then is replenished through another order). The price we pay for the item is essentially immaterial, although the cost of carrying inventory is related to the price (insurance, borrowed money).

If we use 200,000 widgets each year in our production process, if the carrying cost per widget is $4 per year, and if the cost of placing (and taking delivery of) an order is $30, then each time we call our supplier we should place an order for

$$Q^* = EOQ = \sqrt[2]{\frac{2TF}{cc}} = \sqrt[2]{\frac{2 \cdot \$30 \cdot 200{,}000}{\$4}} = \sqrt[2]{3{,}000{,}000} = 1{,}732 \text{ units.}$$

The average inventory is ordinarily assumed to be $Q^*/2$. But if a *safety stock* is held, then the average inventory is $Q^*/2$ plus the entire safety stock (not $Q^*/2$ plus *half* the safety stock), because the safety stock is not worked down to a zero level.

When we are at the true optimal sized order, our total annual ordering costs and carrying costs will be equal. Total carrying cost for a year is average inventory times the carrying cost per unit,

or (1,732/2) x $4 = $3,464 in our example above. Total ordering cost is number of orders placed during the year times the cost of placing each order, or (200,000/1,732) x $30 = $3,464 as well. Think about why. If whatever quantity we order each time can be represented as Q, then the average inventory (we assume steady usage) is ½ Q, and a year's inventory carrying cost is $\frac{1}{2} \cdot Q \cdot cc$ And with quantity Q ordered each time, the number of orders placed each year is T/Q, for a year's total inventory ordering cost of $F \cdot T/Q$, or $T \cdot F \cdot Q^{-1}$. Since ordering and carrying cost are the total costs of managing the inventory, we can state $Total\ Cost = \frac{1}{2} \cdot Q \cdot cc + T \cdot F \cdot Q^{-1}$. Using some very basic calculus, we compute the first derivative of this equation, with respect to Q, as

$$\frac{\partial \text{Total Cost}}{\partial Q} = \frac{1}{2} \cdot cc - T \cdot F \cdot Q^{-2}$$

Setting this derivative equal to zero to find a minimum, we get $\frac{1}{2} \cdot cc = T \cdot F/Q^2$.
Multiplying each side by Q^2, we can restate the relationship as $Q^2 \cdot \frac{1}{2} \cdot cc = T \cdot F$
Multiplying each side by 2, we can restate it again as $Q^2 \cdot cc = 2 \cdot T \cdot F$.
Finally, dividing each side by cc we get $Q^2 = \frac{2TF}{cc}$.
Taking the square root of each side provides our EOQ formula: $Q^* = \sqrt[2]{\frac{2TF}{cc}}$.

(With a positive second derivative value, $2 \cdot T \cdot F/Q^3$, we have a minimum rather than a maximum.) EOQ is said by some to be an outmoded tool in an era of computerized tracking and just-in-time inventory management But even if this argument is true (some of us have some conceptual gripes with the just-in-time idea – which lost a few adherents after 9/11/01 transportation crises caused some interruptions of crucial deliveries), EOQ is a useful means of explaining some of the issues that businesses must deal with in managing inventory.

VII. Financing Current Assets

In preceding sections we were dealing primarily with short-term assets (cash and marketable securities, accounts receivable, and inventory), which are presented at the top of the "left-hand" side of a company's balance sheet. It is assumed that we hold the level of current (and long-term) assets needed to support our expected level of sales. In the following sections, we look primarily at the top of the "right-hand" side of the balance sheet, focusing on the current liability categories of accounts payable (obtaining financing from our suppliers of goods and services) and notes payable (short-term loans of cash, typically from banks).

A. Alternative Current Asset Financing Policies

While there might be a tendency for some portion of current assets to be financed with current liabilities (*e.g.*, inventory financed with accounts payable to some degree), there need be no direct link between any particular asset item and a particular right-hand side item. We might, for example, issue long-term debt or new common stock and use the proceeds to buy marketable securities or inventory.

Our decision on whether to finance current assets with short-term or long-term sources relates to the liquidity *vs*. profitability issue. Remember the *yield curve*, and its typical (in recent decades) upward slope? If we borrow short-term, the interest rate is *likely* to be lower than the rate we would pay for long-term money. Shorter-term loans also tend to be faster to obtain, and they generally are accompanied by lower flotation/administrative costs and fewer restrictions on the borrower's activities (remember bond indenture covenants?) than are longer-term loans.

So *profitability* can be enhanced through short-term borrowing. But then there is a *liquidity* problem: we have to go back to the lender frequently to renegotiate the loans (and to prove that we still have the ability to repay). [Because we can finance with either equity or debt, and because debt can be either short-term or long-term in nature, our decision on how to finance current assets actually relates to both *capital structure* and yield curve issues.]

And if interest rates in the market rise, we will later wish we had locked into long-term financing (debt or equity) that we *could* have afforded instead of facing new short-term rates that we can *not* afford. Thus a fairly *aggressive* plan would involve paying for all current assets with short-term financing sources, and long-term assets with long-term financing sources.

A somewhat less aggressive plan would involve paying for *temporary current assets* with short-term financing sources, and then using long-term financing sources to pay for both *permanent current assets* and long-term assets. [*Permanent current* assets – a seeming oxymoron – consists of the level of inventory and perhaps other "current" assets below which the firm, as an ongoing business entity, never falls, even at the lowest point in the company's cyclical activities. This lowest-point quantity is likely to increase as the business grows over time.]

A *conservative* plan would involve paying for long-term assets, permanent current assets, and a portion of temporary current assets with long-term financing sources. Short-term financing would be used only to pay for the remainder of the temporary current assets. Thus the firm would largely know its cost of financing from year to year, as this cost would not fluctuate much with market conditions. But the firm would receive little benefit from the "normal" yield curve tendency of short-term financing costs to be lower than long-term financing costs.

B. The Cost of "Trade Credit" (Supplier Financing)

Nothing in life is free. Even when there is no *explicit* charge, it makes economic sense for us to assume that there is an *implicit* (not directly stated) cost when one party to a transaction provides

something of value to another party. For example, one way a company initially pays for services provided by its workers and the government is through *accruals* of wages and taxes (we pay workers after a week or month of work has been completed, and might think of our quarterly or semiannual tax payments as being paid after the government has provided us with services, although the link between *tax payments* and value received is much more indirect than the link between *wages* and value received).

And it is true that we do not *explicitly* pay workers more because they have to wait a while to get money that is rightfully theirs. However, it defies logic to think that this delay in payment costs us nothing; surely workers ask for slightly higher wages than they would if they were paid hourly or daily, to compensate them for the accompanying time value loss and lack of liquidity (they may have to run up high-interest credit card bills while they wait to be paid at the end of a week or month). But the differential would probably be fairly small, and we normally treat accruals, for simplicity's sake, as a form of financing that carries no measurable cost.

But a type of informally-arranged financing whose cost we *do* try to measure is "trade credit," or financing from suppliers of goods and services. Because the financing cost comes in the form of paying a higher, non-discounted price for the privilege of paying at a later date, the cost of trade credit is sometimes called the "cost of not taking discounts." (Indeed, accountants treat the extra price we pay by borrowing from suppliers, and thus not enjoying the discounts offered to early payers, as an interest-like cost called "discounts lost.")

Accounts payable represents a substantial portion of short-term financing for numerous firms, especially smaller companies. As we buy more from suppliers who sell to us on credit, we spontaneously generate the financing to pay (initially) for the items purchased. The more we allow our accounts payable to grow, the less money we need to obtain from other sources. So we should determine what it costs to borrow more, and for longer periods, from our suppliers so we can see whether other forms of financing might result in lower costs. What is the cost of borrowing from suppliers, the cost of not taking discounts?

"Discounting" is a financial concept often used in short-term financing situations. The money provider gets a financial return not by requiring an explicit rate of return, but rather by giving the money user less than the money user must pay back. (Think of zero-coupon bonds, in a long-term financing case.) When computing percentage costs in a discounting situation, we find an effective periodic cost – what money users give up in return for what they get to use – and then convert this effective periodic cost to an annual value (APR or EAR) by incorporating the number of periods in a year. Effective costs are proportional figures, unrelated to the dollar amount of any given transaction, but we can sometimes think about discounting situations more clearly in the context of nice, round dollar amounts (*e.g.*, $100).

For example, "terms of credit" may be stated as something like "2/10, net 30." These terms indicate that the buyer can take 2% off (pay 98% of) the invoice price if it pays cash (writes a check that is received) by day 10; otherwise, it is expected to pay 100% of the invoice price by day 30. In other words, the amount the buyer owes is discounted 2% if payment is made early. Think of a $100 invoice. The buyer can pay $98 on day 10, or it can keep the $98 and then, 20 days later, pay $2 more for having kept the $98. So the effective periodic cost (the periodic interest rate used in APR and EAR computations) is

$$\text{Effective periodic cost} = \frac{\text{What Borrower Pays}}{\text{What Borrower Gets to Use}} = \frac{2\%}{100\% - 2\%} = \frac{2\%}{98\%} = 2.0408\%.$$

But that cost is for 20 days. (We treat the cost of extending 10 days of "free" credit as being built into the price paid for the goods.) Over a year there are 365/20 = 18.25 twenty-day periods. So on an annualized basis this cost of supplier financing – the cost of *not* taking trade discounts – can be computed as either an approximation (annual percentage rate, or APR) or a more precise figure (effective annual rate, or EAR):

$$\text{APR} = .020408 \times 18.25 = 37.2449\%.$$
$$\text{EAR} = 1.020408^{18.25} - 1 = 44.5853\%.$$

This cost is fairly high; the buyer of goods would probably be better off to borrow money at a bank, and use the borrowed money to pay early so that it could take the 2% discount. Trade credit tends to be a pretty expensive form of financing, which firms strong enough to arrange reliable bank financing (notes payable) would typically try to avoid using.

The APR and EAR computations shown here are identical to those we worked with in earlier units. Recall that if someone opens a savings account and lends a bank money, charging interest of 2% every three months, then the bank's annual stated (APR) cost of borrowing is a 2% quarterly periodic rate times four periods per year, or 8%, and the true effective annual cost (EAR) is $(1.02)^4 - 1 = 8.2432\%$. (The "periodic rate" we worked with in our basic time value unit is a simplified form of the effective periodic cost we use in a discounting situation.) In our trade credit example, the buyer borrows from the supplier at a 2.04% effective periodic cost, which we multiply by the 18.25 twenty-day periods in a year to get the APR or compound out for 18.25 periods to get the EAR. If this process seems confusing, it is likely just because the discounting and the unusual partial-year time periods cause us to work with numbers that are not nice "round" figures.

Consider some other trade credit combinations, and the accompanying costs. (While terms of 2/10, net 30 seem to be common, a 2015 *Wall Street Journal* story told of a major retailer that was negotiating to pay its suppliers under terms of 3/15 or even 5/15, net 60, so clearly other possibilities exist.) Note that we compute APR as (effective periodic cost x number of periods in a year) and the more correct EAR as $[(1 + \text{effective periodic cost})^{\text{number of periods in a year}} - 1]$:

- 3/10, net 45

$$\text{APR} = \frac{3}{97} \text{ x } \frac{365}{45-10} = .030928 \text{ x } 10.43 = 32.2579\%$$

$$\text{EAR} = \left(1 + \frac{3}{97}\right)^{\frac{365}{45-10}} - 1 = (1.030928)^{10.43} - 1 = 37.3952\%$$

[The buyer incurs a 3.09% effective periodic cost 10.43 times each year (keeping its money each time for an extra 45 – 10 = 35 days).] Why is the cost of supplier financing – the cost of not taking discounts – so high? Because 3% is a fairly generous discount, so passing it up is costly.

- 3/10, net 120

$$\text{APR} = = \frac{3}{97} \text{ x } \frac{365}{120-10} = .030928 \text{ x } 3.318 = 10.2619\%$$

$$\text{EAR} = \left(1 + \frac{3}{97}\right)^{\frac{365}{120-10}} - 1 = (1.030928)^{3.318} - 1 = 10.6348\%$$

Why is the cost of supplier financing – the cost of not taking discounts – so *low*? While the buyer gives up a generous 3% discount, it gains the right to keep its money for an extra 110 days before paying. So passing up the discount, and letting the supplier "carry" the buyer, is not such a bad thing.

- Cheating example #1: taking the discount later than the buyer should. Let's say that the terms are 2/10, net 30, but the buyer "cheats" by paying the discounted price on day 20. (If we can assume that the buyer would otherwise pay the full invoice price on day 30 – and perhaps it actually would not, but this assumption serves as a useful benchmark – then the buyer has essentially redefined the terms as 2/20, net 30.)

$$\text{APR} = \frac{2}{98} \text{ x } \frac{365}{30-20} = .020408 \text{ x } 36.5 = 74.4892\%$$

$$\text{EAR} = \left(1 + \frac{2}{98}\right)^{\frac{365}{30-20}} - 1 = (1.020408)^{36.5} - 1 = 109.0491\%$$

Why is the cost so *high*? Because by cheating in this manner, the buyer has made it much more attractive to *take* the discount. So now it is unattractive *not* to take the discount.

- Cheating example #2: paying the full invoice price later than the final date specified. Let's say that the terms are 2/10, net 30, but the buyer "cheats" by paying the non-discounted price on day 70. (If we can assume that the buyer would otherwise pay the discounted price on

day 10 – and perhaps it actually would not, but this assumption serves as a useful benchmark – then the buyer has essentially redefined the terms as 2/10, net 70.)

$$\text{APR} = \frac{2}{98} \text{ x } \frac{365}{70-10} = .020408 \text{ x } 6.0833 = 12.4148\%$$

$$\text{EAR} = \left(1 + \frac{2}{98}\right)^{\frac{365}{70-10}} - 1 = (1.020408)^{6.0833} - 1 = 13.0770\%$$

Why is the cost so *low*? Because by cheating, the buyer has made it much more attractive to let the supplier "carry" it for a longer period, since the buyer pays nothing extra (explicitly, anyway) for extending the payment date. Paying late is such a good deal that now it is unattractive to pay early and *take* the discount.

Three final points to note.

- Cheating as illustrated above may not carry an immediate, explicit cost to the abuser, but there are indirect costs that can mount over time, including the erosion of relationships with suppliers and the accompanying erosion of the firm's credit reputation (the former can result in the supplier's eventual unwillingness to extend credit, and the latter can result in other lenders' unwillingness to lend just when the firm needs credit the most).

- The computations shown above are based on the assumption that all suppliers charge the same price for a particular item regardless of the terms of credit they offer, such that there are, for example, no additional hidden finance charges through charging a higher price in return for being lenient with those who pay late. But in a "real world" situation, suppliers that grant more lenient credit terms may also be charging higher prices for the goods they supply, and this higher price should be taken into account in a complete analysis of the cost of trade credit.

- The cost, as computed above, of financing with trade credit (accounts payable) represents the rate of *return* that the materials supplier *earns* on receivables from buyers that do not take the discount – as long as all such customers pay by the specified final payment date, *e.g*. day 30 if terms are 2/10, net 30 (but, of course, not all will, so suppliers do not earn that high a return, on average – if they did, then supplying credit would be a major profit generator).

C. <u>The Cost of Bank Financing</u>

1. Short-term Business Loans: Qualitative Issues

Banks and other lenders (such as commercial finance companies) decide whether to make short-term loans to business borrowers based on their analysis of the "5 *C*s" of lending: *C*haracter (willingness to pay), *C*apacity (ability to pay through income), *C*apital (ability to pay through

wealth), *C*ollateral (specific assets pledged), and *C*onditions (strength of the economy). *C*ontrol (regulatory issues affecting lender/borrower) is sometimes cited as a 6th "*C*." A firm that does not measure up favorably overall with regard to these issues is unlikely to be granted a loan.

A firm should choose a bank with lending policies that are compatible with the firm's needs. The bank should be large enough to be able to provide the amount of money the borrower needs, and should have expertise in the borrower's line of business so that it can provide advice and other services.

When a lender makes a loan, the borrower signs a *promissory note* that spells out the terms of repayment. The interest rate charged on a short-term business loan typically relates to the *prime rate*, which is a benchmark rate that applies to strong business borrowers. Weaker borrowers present additional risks and therefore pay rates above prime, while exceptional borrowers present such low risks that they may be able to borrow at rates below the quoted prime rate. A lender might or might not require a business borrower to pledge specific assets (typically receivables or inventory) as collateral, and might or might not require key individuals in the business to provide personal guarantees that the loan will be repaid (the latter is especially common in small business borrowing situations).

Payments can be structured in various ways. Maturities can be as long as several years, but banks typically lend to businesses for a year or less, with 90-day and 6-month maturities not uncommon. The interest rate can be fixed, or the promissory note can specify a rate that *floats* (varies) with market conditions, with floating rates more common on longer-term commitments. The amount of interest owed is sometimes computed based on a 360-day year (which gives the lender a slightly higher return). The repayment schedule may provide for the payment of only interest until the loan matures (and then the principal is repaid all at once, for example the note might provide for monthly interest payments and then repayment of principal after six months), or for full or partial *amortization* (in which each *installment* payment contains interest for the period and a portion of the principal owed).

2. Short-term Business Loans: Quantitative Issues

Instead of obtaining short-term financing on an ongoing basis by borrowing from its supplier of goods or services (by passing up the discount offered, and instead paying the higher full invoice price at a later date), a firm might pay earlier (pay on day 10) and take the discount (pay only 98% of the invoice price, if the terms are 2/10, net __) by paying with money borrowed from a bank. Consider a case in which different banks all quote stated nominal annual interest rates of 9% on a short-term loan of $100. What is the true cost of borrowing?

a. Annual Payments

For a one-year loan with one end-of-year payment the annual percentage rate, or APR, and the effective annual rate, or EAR, should be the same, because there is no intra-year compounding. But the size of the single end-of-year payment, and the effective cost of borrowing, can differ depending on the circumstances.

i) Simple Interest

The borrower receives $100 today, then pays back that $100 plus $9 in interest after 1 year. Recall that the effective periodic cost is what the borrower pays for what it has gotten to use: here that amount is $9/$100 = 9%. Since the borrower gets to use all the stated principal for the entire year, the effective cost of borrowing on this simple interest basis is simply the stated interest rate. Note also that we do not have to know the dollar amount; here the borrower pays 9% of the stated loan amount in interest in return for having had use of all of the money: 9%/100% = **9%**.

ii) Discounted Interest

Discounting a loan is computationally identical to discounting in the trade credit situation seen earlier; we combine an effective periodic cost with the number of periods in a year. If the loan is on a discounted basis, then the borrower must pay $9 in interest "off the top" today, in return for the use of $100. So actually the borrower receives a net amount of only $91 at the loan closing, and

$$\text{Effective periodic cost} = = \frac{\text{What Borrower Pays}}{\text{What Borrower Gets to Use}} = \frac{9\%}{100\% - 9\%} = \frac{9\%}{91\%} = 9.8901\%.$$

Here the loan is repaid at the end of a full year, so there is only one period. Thus the APR and EAR are both **9.8901**%.

Note also that in this case the borrower would have to borrow *more* than $100 to end up with the $100 needed. Specifically, the borrower would have to borrow $100 ÷ .91 = $109.89, such that if it borrows $109.89 and the bank takes 9% interest off the top the borrower ends up with the remaining 91%, or .91 x $109.89 = $100 (a process called "grossing up" the amount borrowed).

b. Non-Annual Payments

i) Add-On Interest

In this type of loan the lender adds the $9 in interest to the $100 principal amount, then divides the $109 total by 12 to get a monthly payment of about $9.08. One way to think about an add-on loan is that the borrower pays $9 in interest over the year, but has the use of only about half of the stated principal, on average, since principal is systematically repaid during the year. So an approximation of the effective cost is 9% x 2 = 18%.

More accurately, we set up the situation as a present value of annuity problem: the borrower receives $100 today and repays $9.08 per month 12 times; solve for *r*. The true effective periodic cost turns out to be 1.35% per month or, with 12 monthly periods in a year:

$$\text{APR} = .0135 \times 12 = 16.2\%.$$
$$\text{EAR} = 1.0135^{12} - 1 = \mathbf{17.46\%}.$$

If the lender were to report an annual percentage rate (APR) of interest (a requirement under federal law for consumer loans, but not for business loans), the reported figure would be a slight underestimate of the true borrowing cost, since an APR does not take into account intra-year compounding – but it would be a more correct answer than the 9% stated rate.

ii) Discounted Interest

What if the 9% (stated annual rate) loan that is discounted is made for only three months? First we divide the 9% stated rate by 4, for a periodic rate of 2.25%. But because the interest is discounted, on a $100 loan the borrower would receive $100 – $2.25 = $97.75 today, and then pay back $100 (the $97.75 plus the $2.25) in three months. So the effective periodic cost is:

$$\text{Effective periodic cost} = = \frac{\text{What Borrower Pays}}{\text{What Borrower Gets to Use}} = \frac{2.25\%}{100\% - 2.25\%} = \frac{2.25\%}{97.75\%} = 2.3018\%,$$

such that
$$\text{APR} = .023018 \times 4 = 9.2072\%$$
$$\text{EAR} = 1.023018^{4} - 1 = \mathbf{9.5300}\%$$

(again, the APR slightly underestimates the true borrowing cost, but is a more correct answer than the 9% stated rate).

Note that the true effective cost of borrowing can be very different from the stated interest rate. Note also that any of these rates would seem to be lower than the cost of not taking a trade discount. Thus it is often cheaper to borrow from a bank (so the buyer can pay cash on day 10, or whatever day marks the end of the discount period, and *take* the discount) than to borrow from the supplier (*i.e.*, pay on day 30 and *not* take the discount).

D. Other Types of Short-Term Loans

1. *Lines of credit*, under which the bank is required (committed line) or agrees in principle (uncommitted line) to lend to the firm on an as-needed basis.

2. Borrowing against the value of *accounts receivable* ("assignment" or "pledging"), or selling the receivable claims ("factoring," a procedure also typically characterized by discounting, such that the cost would be computed just as in our trade credit and discounted loan examples above, with an effective periodic cost reflecting the discount and the number of periods reflecting the company's average collection period).

3. Borrowing with *inventory* as collateral, through *blanket liens* (on small items that can not be controlled separately), *trust receipts* (also called *floor planning*, on large items like cars that can be controlled and monitored by serial number), or *field warehousing* (putting a third party in control of inventory that is hard to move around).

4. *Commercial paper*: large denomination, short-term unsecured bonds that large, financially strong companies can issue. Commercial paper is (at least sometimes) sold on a discount basis, so we compute the percentage cost of borrowing just as we compute the cost of not taking a trade discount or a discounted bank loan or the factoring of accounts receivable: with an effective periodic cost based on the discount, and a number of periods in a year based on the commercial paper's maturity. (Maturity is always 270 days or less, to avoid onerous government registration requirements that apply to longer-term securities.) The interest cost can be quite low, even below the prime rate for bank loans.

> A problem is said to be that the commercial paper market is impersonal, with no relationships established between the lender (essentially the bond market) and the borrowing firm, so the firm does not have a lender that will "stand by" it in times of financial difficulty. Yet some observers feel that the entire lending market has become impersonal, with many of the relevant personal relationships ultimately eroded by mergers and high personnel turnover in the banking industry (and perhaps within borrowing firms, as well). Issuers of commercial paper sometimes maintain lines of credit with banks (they typically have to pay the banks fees for this service), so that they have "standby" sources of money should the commercial paper market become inaccessible. ✍