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ANALYTICAL AND THEORETICAL EXTENSIONS
OF DOUBLE ENTRY

88-64

James J. Linn

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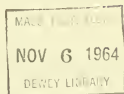
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Recent analysis has revealed that double entry can be represented analytically as two separate partitionings of the same finite point set.¹ One natural consequence of this analysis is conjecture about extending double entry through the discovery or construction of additional bases for partitioning. Any extension must have two vital qualities. First it must be analytically possible. That is, it must be truly an extension not an entirely different information processing model. Second, and equally important, the extension must have practical value. Thus if an extension is analytically possible but cannot be utilized to produce meaningful information, it is not an extension of double entry. It would be only an extension of the analytical model of double entry.

A definition of double entry which is consonant with practice and the analytical model is "double entry is a partitioning of unit-dollars-of-account of a firm by source and by present use."² Extension of this definition requires that it be feasible mathematically; that a set of operations incorporating this extension is feasible; and that one or more additional characteristics, the bases for these additional partitionings, must be found.

Such extensions could be used in two ways. Multiple rather than two partitionings of the unit-dollar-of-account could be made or, two partitionings could be made but on the basis of other than the traditional characteristics. Since two fold partitioning requires no change in traditional operations but the multiple partitioning does, and since both require that additional characteristics be found, only the additional partitionings problem will be considered.

¹James J. Linn, "An Analysis of Double Entry," (Working Paper 87-64, Alfred P. Sloan School of Management, Massachusetts Institute of Technology, 1964), p. 5.

²Ibid., p. 1.

Operational Mechanisms

To introduce an additional partitioning into the traditional system of double entry, say P (in addition to A for assets and E for equities), it is necessary to introduce some mechanism analogous to debit-credit for this third partitioning which can be integrated with the classical debit-credit mechanism.

An inspection of Table I will illustrate some of the problems this entails. The left side of Table I is a presentation in tabular form of the relationship between the two partitions, increases or decreases, and the debit-credit mechanism. The right side of Table I is a representation of the extended double entry concept. The analog of debit and credit for the new partition has been designated as *evit* and abbreviated as *er*. As shown in the illustration the first line is easy to fill. It is the second line which is difficult.

Table I

Classical			Extended			
Assets	≡	Equities	Assets	≡	Equities	≡ P _____
dr		cr	dr		cr	er
cr		dr	cr		dr	?
dr	cr					
		<i>cr dr</i>				

The problem is how to represent a decrease in P _____; by a *dr* or a *cr*? As you will notice from the second line of the classical case, debit and credit mean decrease when reversed. But the extended case is a ternary instead of a binary situation while the remainder of the characteristics of the extended case (i.e., increase or decrease) remain binary. Thus we have a ternary situation with binary characteristics and notation.

If we reduce the extended case to a binary situation the solution is easy. This is illustrated in Table II where the two possible additional binary cases which can be formed from the extended case are illustrated.

Table II

Reduced extended case

Assets	≡	P	_____	Equities	≡	P	_____
dr			er	er			er
er			dr	er			cr
dr	er			cr	er		
		er	dr			er	cr

This is not, however, a solution to the problem. All three partitionings must be handled identically and at the same time. Any increase in the total dollar units of account is an increase in each separate partitioning and the same is true for any decrease. Even internal partition changes cannot be handled because there are always two choices for labeling the decrease.

This illustrates ^{the} difficulties of extending the debit-credit mechanism to accommodate an additional partitioning. It has not been shown, however, that the additional partitioning cannot be handled in some fashion.

In the traditional method the debit-credit mechanism and the account affected jointly indicate whether an increase or decrease has occurred. I have just shown that an extension of the traditional mechanism--debit-credit-evit-- is not possible. However, the traditional methods and mechanisms of double entry are not unique. They can be replaced and the same results obtained.

This is illustrated, analytically, in Table III. A journal form based upon this is given in Table IV. The amount is shown at the right. There are three pairs of columns. Of each pair of columns one column is for accounts which are increased by the amount shown at the right, and the other is for accounts decreased. Each pair of columns is restricted to the accounts representing one partitioning.

Table III

	Assets	Equities	Partitions
Increase	10	10	10
Decrease	- 5	- 5	- 5
No change	7 -7		
No change		6 - 6	
No change			- 9 9

Table IV

	A		E		P		Amount
	+	-	+	-	+	-	
Accts. Rec.			Sales		"Account"		10
	Cash			Accts. Pay.		"Account"	5
Raw. Mat.	Cash						7
			Accts. Pay.	Notes Pay.			6
					"Account"	"Account"	9

Due to the absence of a set of account titles "Account" is used in the last pairs of columns for the various account titles of the third partitioning.

All the necessary information is provided. Each affected account is shown along with the type of effect (+ or -) and the magnitude of the effect. With this system of mechanics, as many characteristics, and their partitionings, as desired, can be utilized. It is apparent from these two tabular illustrations, that it is analytically and operationally possible to utilize multiple partitionings.

Basis for Additional Partitions

It is now necessary to give real world content to these extensions. I will begin by searching for one additional consonant characteristic.

Time is usually mentioned as a basis for extension. Unfortunately time is more compatible to a flow than a stock. A flow¹ occurs with the passage of time and a stock exists at an instant of time. Double entry is based upon a stock concept, the stock of dollar-units-of-account. An additional characteristic, to be a basis for extending double entry, must be based upon the stock concept.

The two original bases for partitioning were source and present disposition of dollar-unit-of-account. Since one of these, source, refers to the past and the other, present use, refers to the present, a possible basis for a third partitioning may be the future use or the destination of the dollar-units-of-account. Such a basis for the third partition would be entirely consistent with the two present bases and would be an extension of the concept underlying them.

Past	→	Present	→	Future
Source		Use		Destination

¹The flow information, income statement, funds flow statement, etc., are a by-product not a direct result of double entry.

The past refers to events over time in the past while the present refers to an instant of time. The acquisition of capital, the incurrence of liabilities and the accumulation of retained earnings occurred at various instants in the past or, in the case of retained earnings, continuously. Why not treat the future similarly as the past and indicate the eventual destination not the destination at some instant in the future. This relates to what is expected, a plan, instead of what will be, knowledge of the future.

Unfortunately this is not possible. The characteristic, source, is related to the time that dollar-units-of-account first appear in the firm. This is initial entry into the firm not the latest re-entry in the sense of turnover. The analog of this for the characteristic destination would be the time that the dollar-units-of-account disappear or leave the firm, not any departure which would be immediately followed by re-entry. This would be the time and events associated with losses and liquidation of the firm. This is interesting, but hardly of value to an operating firm which envisions a continuing life.

Since everything becomes cash or cost of goods sold in the course of the life of the business, perhaps it would be best to use some future point in time as the focus and consider the destinations of unit-dollars-of-account at that time. The projected income and balance sheet statements are perfectly good devices for doing this. Incidentally the funds statement is not related to a new characteristic either since it is based upon and derived from the existing traditional double entry data. It seems as if there is no possibility of extending traditional double entry.

There is something else which is clearly analytically and operationally possible. Perhaps there are two additional characteristics of dollar-units-of-

account which are related. Then the double entry process could be applied to these. A major drawback to this would be the need to have two separate accounting systems if traditional accounting information as well as the new information were desired.






Conclusion

The analytical model of double entry can be extended either by replacing one of the traditional bases for partitioning or by introducing additional partitionings. If additional partitionings are introduced the traditional debit-credit mechanism of double entry is inadequate. It is uniquely suited to double partitioning and cannot be extended. However, an alternate method incorporating the same operations is feasible.

Unfortunately no real world content could be found for even one additional partition. No other characteristic of dollar-units-of-account which would provide an acceptable basis could be found. Thus while it is analytically feasible to extend double entry there does not appear to be any acceptable operational basis for doing so.

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