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ON VELOCITY IN SEVERAL COMPLEMENTARY CURRENCIES

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ABSTRACT

We analyse the velocity of several complementary currencies, notably the WIR, RES, Chiemgauer, Sol, Berkshares dollars, and several other cases. Then we describe the diversity in their velocity of circulation, and seek potential explanations for these differences. For example, WIR velocity is 2.6 while RES velocity is 1.9 despite being similar currencies. The higher speed may be explained by WIR blended loans among other benefits or by the fact that there are nearly 20.000 unregistered members that contribute with their transactions. Using a comparative method between cases, the article explores a number of possible explanations on the increases in velocity, apart from prevailing demurrage approaches

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INTRODUCTION

This paper approaches the subject of the velocities of currencies from the naïve perspective of a practitioner eager to understand the success factors for the deployment of a new currency from the perspective of the velocity. We narrowed the focus of the study to velocity for the sake of simplicity. We try to divide the study into more simple questions and try to answer them to reach in the end a global understanding of the problem. This comparative study on velocities of several currencies gathers data from several interviews and studies of the practitioners, and then figure out what features might have contributed to the higher velocities.

We are aware that focusing only on velocities does not guarantee the success of a currency, but gives interesting insight on what to expect from it if it scales up in size or scope. In the case of the first author of this paper, being him involved in the deployment of RES in Catalonia, the paper tries to focus and contribute with light on what worries him: what if after all the investment the Catalonian community is not sustainable? The fact is that creating a network is a balance of investment into the community and the benefit/utility that the community perceives. The velocity is an indicator that the currency is useful to a community and an encouraging indicator to go on investing in its growth and success.

The paper in section 1 is an introduction to the concepts behind velocity and data on the velocity in the sites where the complementary currencies are studied; section 2 explains the data gathered from the mentioned complementary currencies; section 3 dissects their features; and section 4 makes the suggestions of the main features for higher velocities.

2. ON VELOCITY OF CIRCULATION

Velocity of money is the rate at which money circulates, changes hands, or turns over in an economy in a given period. Higher velocity means the same quantity of money is used for a greater number of transactions and is related to the demand for money. It is measured as the ratio of GDP (Gross Domestic Product) to the given stock of money. It is also called velocity of circulation. It is an indicator of the demand for money, of how people prefer to spend or retain money.

The velocity of money is simply "nominal" or current GDP divided by money in circulation. This is seen in the 'quantity of money equation', which is an identity, or true by definition: $M*V \equiv P*Y$, where M is the Money Supply, V is Velocity, P is the Price Level, and Y is price-adjusted or 'real' GDP. Thus $V \equiv P*Y/M$, or in other words GDP at current prices divided by the Money Supply M.

Let us illustrate velocity with an example: A farmer and a mechanic, with a combined amount of 500 Euro in cash buy goods and services from each other in three transactions this year. The farmer spends 400 Euro on tractor repairs and 100 Euro of barn hinges from the mechanic and the mechanic buys 500 Euro of nuts and almonds from the farmer. Then 1,000 Euro changed hands in a year, when there were only 500 Euro in cash in this tiny economy. That 1,000 Euro level is possible because each euro was spent on goods and services an average of twice a year, which means that the velocity was 2. Note that if the farmer made the nuts and almonds a gift to the mechanic, it would not go into the numerator of velocity because that transaction would not be part of this toy example of a tiny economy's gross domestic product.

The more GDP per volume of money, the faster money circulates. During booms, people become optimistic and money tends to circulate with greater velocity, while in depressions, everyone guards it and it circulates more slowly. Thus economists say that velocity is 'pro-cyclical' – it tends to go up and down at the same times as GDP, only more so. This finding is well-established in economics (Tobin, 1970; Goldberg and Thurston, 1977; Leão 2005). The pro-cyclical (or even 'hyper-cyclical') nature of velocity can be seen clearly in recent US data. We can show the annual percentage change in GDP as broken down into components of percent change in Money Supply (measured by M2, see below) plus the percent change in Velocity. This decomposition stems from the above quantity equation of money. We have shown that

$$M*V \equiv P*Y \equiv \text{Nominal GDP}$$

where Nominal GDP means, as measured in current prices. From this it follows that

$$\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y = \%\Delta \text{Nominal GDP}$$

Note that $\%\Delta P$ (percentage change in Prices) is just the inflation on GDP, while $\%\Delta Y$ is the inflation-adjusted or 'real' change in GDP – both terms familiar to readers of financial news. $\%\Delta M$ is the percentage change in the Money Supply, and $\%\Delta V$ is the percentage change in Velocity.

This decomposition for the US, from 2000 to early 2014, is shown in Figure 1, where M is expressed by the measure M2, and its corresponding V by M2V.

The periods with a darker background show recent official US recessions. Note that Figure 1 shows M2 growing at a faster rate during these recessions – as the Federal Reserve (the US central bank) attempts to counteract recessions by increasing the Money Supply. That is something that central banks can easily do. What they cannot do, however, is to control Velocity. As in the old US 'cowboy' saying – you can lead a horse to water, but you can't make it drink. As one can see from the above graph, Velocity tended to fall during these recessions – even more so than the fall in GDP itself. Thus it can be seen that recessions are closely linked with changes in Velocity, which of course limits central banks' ability to counteract recessions by monetary policy alone.

Since GDP is average cash balances times velocity, the demand for these balances will be inversely related to velocity. This definition of national money supply and velocity

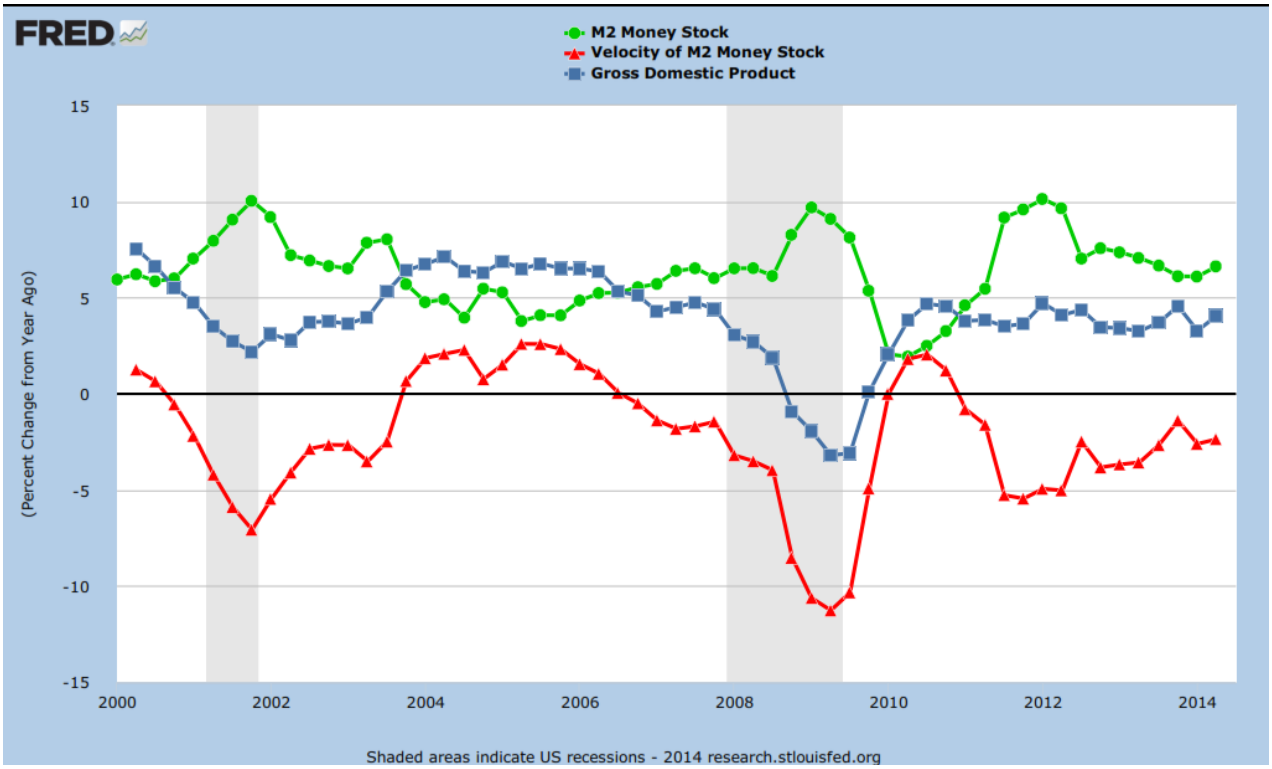

Figure 1. Annual Percent Change in M2, M2 Velocity, and GDP, 2000-2014 (Quarterly Data)
Source: Federal Reserve Economic Data (FRED)

may also be applied to special purpose moneys, such as the Swiss WIR. Thus Stodder and Lietaer (2012) compute WIR velocity as annual Turnover, or value of all transactions carried out in WIR, divided by total WIR balances.

Stodder and Lietaer (2012) show that velocity is higher for Registered WIR-Clients, compared to Non-Registered clients, usually large companies. They argue that the countercyclical WIR Turnover for Registered firms is driven by changes in Velocity.

The Lietaer's Equation Exchange formula for dual-currency systems is

E = (Ms * Vs) + (Mc * Vc)

In periods of crisis Vs↓ but Vc↑ therefore a countercyclical effect. This is shown by Stodder and Lietaer (2012)

Maybe it is also worth explaining that in credit crunches Ms↓ (stock of money supply ↓ as loans are paid off and no new loans are granted), and that credits granted on Complementary Currencies (CCs) can make Mc↑. However, in the beginning of a crisis the most important factors are sending market signals that a) business will have profits so that they're not afraid of investing, b) consumers will have employment so that they need not be afraid and start saving, and c) prices will not fall, so that investors and consumers need not postpone expenditure decisions. Increasing the money supply is not only for increasing M, but also and most importantly a market signal to psychologically convince investors and consumers that there'll be liquidity in circulation and that they need not slow down expenditures. So it is more an issue of velocity of circulation rather than of stock of money supply.

There is no exact way to determine the right size of the money supply. Money supply data are recorded and published principally by the central banks of various countries. The European Central Bank's definition of euro area monetary aggregates is (European Central Bank, 2014):

M1: Currency in circulation + overnight deposits (+ traveller checks and other checkable deposits, in the USA)

M2: M1 + deposits with an agreed maturity up to 2 years + deposits redeemable at a period of notice up to 3 months (in the USA, M2: M1 + most savings accounts, money market accounts, retail money market mutual funds, and small denomination time deposits (certificates of deposit of under $100,000).

M3: M2 + repurchase agreements + money market fund (MMF) shares/units + debt securities up to 2 years

In practice, for most countries the M2 or M3 definition of the money supply is the most representative. M2 is most often used to compare velocities of worldwide currencies. As well, for the sake of simplicity, and because Complementary Currencies (CCs) have no sophisticated mechanisms for regulating the money supply apart from commercial loans and money-in, we will compare the velocity of the CC

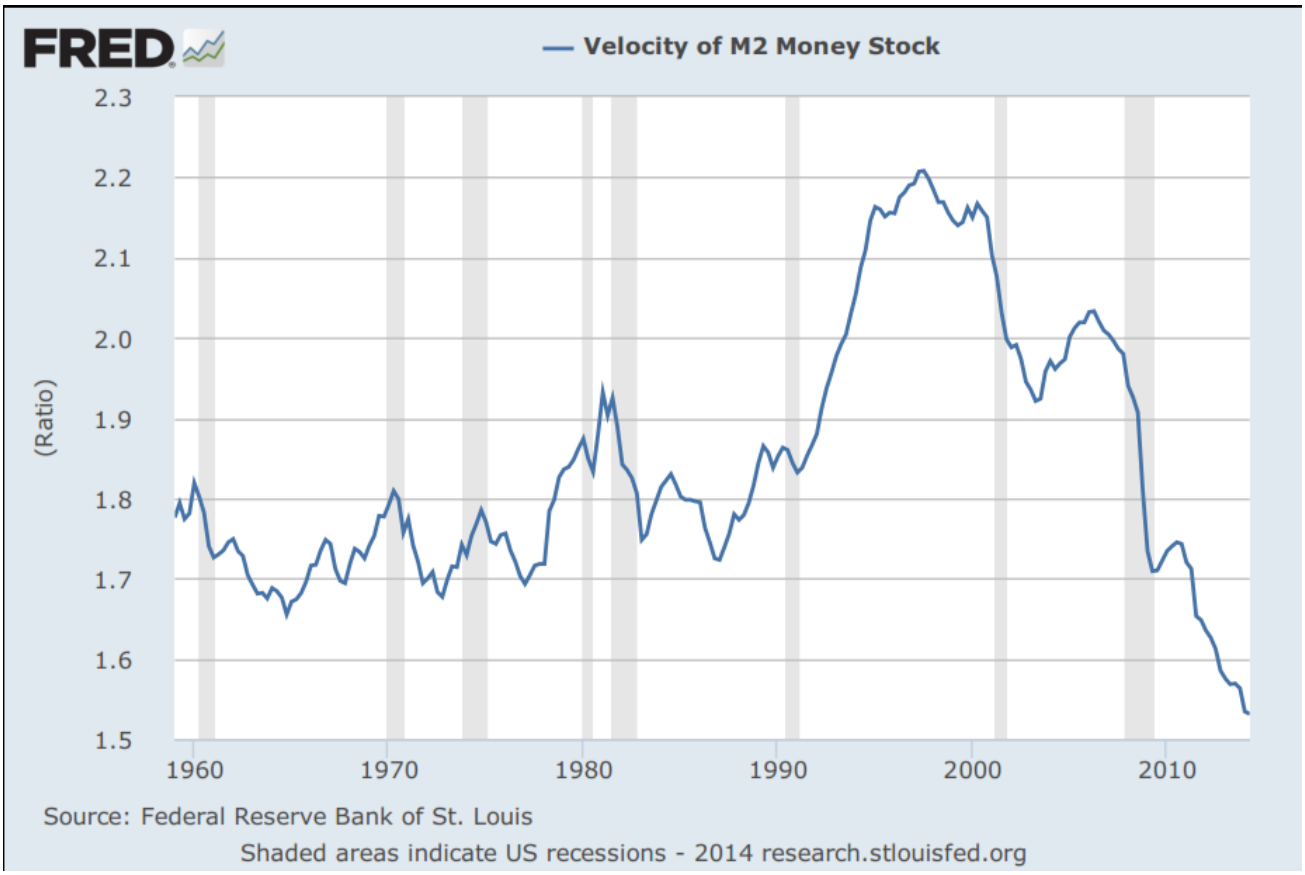

Figure 2. Velocity of US Money Supply (M2), 1958, Q-IV to 2014, Q-I.
Source: Federal Reserve Economic Data

only with the velocity calculated with GDP / M2 of their respective countries.

The velocity of the US dollar in 2012 was 1.537 (Federal Reserve Bank of St. Louis, 2014a). M2 velocity is currently (2nd Quarter of 2014) at 1.531. This is a long-term low, as Figure 2 makes clear.

The very low circulation of the US dollar is probably due to its use as the major reserve currency in the world, both for central banks and for private individuals living outside the US and was part of a recent study by the Federal Reserve (Judson, 2012). This same study also finds (p. 10) that the proportion held abroad is growing as the dollar's role as a reserve currency strengthens, and that this is contrary to the trend of other currencies, where greater use of electronic (cashless) payments can be expected to increase velocity. This slowdown has largely to do with the Federal Reserve's policy of "Quantitative Easing" – massively increasing the US money supply to bring down its long-term interest rates.

This US pattern of declining M2 velocity since the onset of the global financial crisis in 2008 has been followed by most large world economies, and by the world as a whole. Figure 3, with a selection of recent M2 velocities from World Bank sources, illustrates this. Most countries did not have as big a fall-off in velocity as Russia and Turkey, the high-flyers on this list. But it will be seen from the World Series (with the large square dark marker) that there was a significant fall off worldwide in 2009. Note also that most of the economies on this list with very low velocities are those with relatively large financial sectors.

If velocity is indeed highly pro-cyclical, and the world as a whole showed slowing velocity in the financial crisis, is it fair to conclude that velocity is positively linked to changes in GDP? At a fairly trivial level, this must of course be true. If we are looking at nominal GDP -- i.e., GDP in the prices of the day -- then for any fixed level of money supply M, a rise in nominal GDP must imply a rise in M. This is because

$M*V = P*Y \Rightarrow \%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y = \%\Delta$Nominal GDP.

And so for fixed M; i.e., $\%\Delta M = 0$, we have $\%\Delta V = \%\Delta$Nominal GDP.

Of more interest is the relation between velocity and 'real,' or inflation-adjusted GDP. Both of the previous graphs suggest a positive link here. To check this empirically, we test a very large panel data from 2000 to 2012 for 183 countries, plus the "World" and the Euro-zone – a total of 185. Regressing real GDP against M2 velocity (and vice versa) for each country in a fixed-effects panel data setting. Here we are using the previously mentioned World Bank data series "Money and quasi money (M2) as % of GDP" and "GDP (constant 2005 US$)", both from data.worldbank.org.

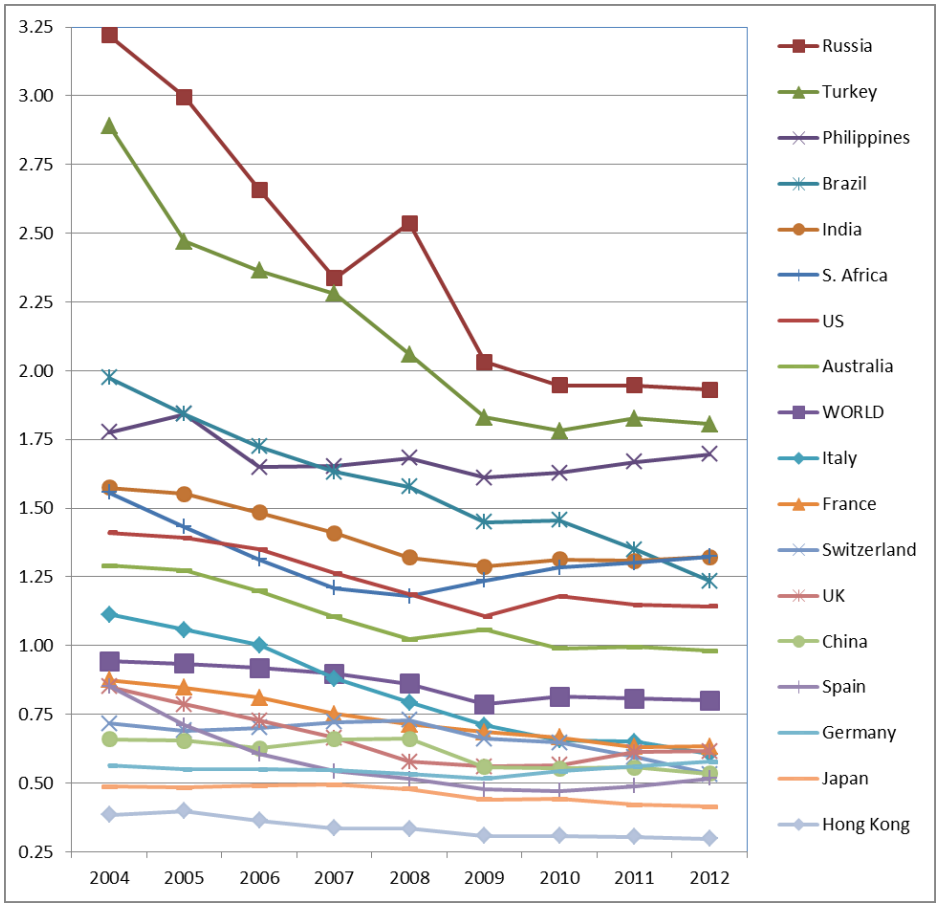

Figure 3 – Velocities of the several currencies of the world wide economy.

Source: "Money and quasi money (M2) as % of GDP" (Inversion gives Velocity), World Development Indicators, available online from data.worldbank.org.

The use of the econometric time series technique known as "Vector Error-Correction Models" in Table 1 allows us to investigate both the short-term and the long-term relationship between GDP and Velocity, and to test its causality in both directions, for those readers oriented to econometric studies.

In Table 1, note that the "Cointegrating Equation" shown at the top has Log Velocity as negatively co-integrated with the Log of Real GDP, and vice-versa – even after a negative time trend variable is taken into account. This can be interpreted as a long-term tendency for velocity to gradually fall as GDP grows over time, yet maintaining a stable relation with each other.

Because these are logged variables, these coefficients can be interpreted as "elasticities," or the proportional sensitivity of one variable to another. E.g., the coefficient of 0.0335 on L_Velocity in the first column indicates that a 100% increase in Velocity will over time be associated with a 3% increase in GDP. The coefficient of 0.1349 on LrGDP in the second column means that a 100% increase in real GDP is associated with a 13.5% increase in Velocity.

Note that this 'long-term' portion of the Vector Error-Correction model, with its negative and stable relationship between Velocity and GDP, is quite similar to the variation across countries that we saw in figure 3. Countries with larger per-capita GDPs often show lower velocities. Figure 2 showing variation across countries, however, is distinct from our regression showing the average correlation of these variables within each country over time. While it is common to conflate the two, they should not be assumed to be the same (Easterly, 1999). Panel econometric methods are valuable because they allow us to separate out a general time trend, as distinct from a cross-sectional snapshot.

Note also that the downward time trend of our previous graph is consistent with this regression results, although real GDP has been unusually stagnant in rich countries over this past decade.

Moving now to the short-term portion of the regression – the part generally taken to be of most policy interest – we see that the two coefficients that are statistically significant on the first and second lag of L_Velocity show first a negative and then a positive sign. The elasticity interpretation of this first-lagged term is that a 1 percent increase in M2 Velocity is associated with a 0.06 percent decrease in real GDP. Thus, this shows Velocity as a counter-cyclical variable – quite the opposite of our previous graph on US GDP and M2 Velocity. The second-lagged term, however, shows a positive sign – as consistent with well-established research on advanced economies, as previously mentioned (Tobin, 1970; Goldberg and Thurston, 1977; Leão 2005).

In the next-to-last row (b), serial correlation (aka autoregression) is problematic. The null of no first-order serial correlation is strongly rejected. Things may not be quite as bad as they seem, however, since these estimates use White

Table 1: Vector Error Correction Model of the 2 year moving average of Log of Real GDP (LrGdpMa2) and Log of M2 Velocity (LVelMa2). T = 9 Years, N = 178 countries, Observations (unbalanced panel), O = 1569. Fixed-effects estimators, White Period Covariances, no degrees of freedom correction.
*t-statistics in [ ]; ***: p-val ≤ 0.01, ** : p-val ≤ 0.05*

Notes: P-values in a) - c) are on null hypotheses of: a) No panel or group cointegration, v and rho statistics; b) No first-order serial correlation (Wooldridge AR test); and c) Independent variable does not Granger Cause dependent variable. For c), the p-value is for the 'stacked' or averaged Granger statistic at 2 lags, as in the equation above. Breitung t-stat tests could not reject the null hypothesis of a unit root on either variable.

Sample (adjusted): 2003-2012; Periods: 9, Cross-sections: 178				
Cointeg. Equ. (DOLS)	**Depend. Variable: LrGDPma2(-1)**		**Depend. Variable: L_Velma2(-1)**	
Cointeg. Equ. (DOLS)	23.5974		-2.2982	
Constant	-0.3663		9.5508	
Trend	[-2.787]		-0.0217	
L_Velocity(-1)	-0.0170			
	[-0.588]	***	-0.3663	
LrGDP(-1)			[-2.787]	***
Indep. Variables:	**D(LrGDP)**		**D(L_Velocity)**	
Cointeg.Equ._RES(-1)	-0.4145 [-6.852]	***	-0.6916 [-7.776]	***
D(LrGdpMa2(-1))	0.7400 [15.042]	***	0.0020 [0.03]	
D(LrGdpMa2(-2))	-0.2442 [-2.822]	***	-0.2466 [-3.052]	***
D(LVelMa2(-1))	-0.061 [-3.821]	***	0.6025 [14.249]	***
D(LVelMa2(-2))	0.036 [2.048]	**	-0.226 [-6.819]	***
Constant	0.0198 [8.113]	***	-0.0092 [-2.707]	***
R-squared	0.666		0.564	
Adj. R-squared	0.622		0.506	
S.E. of regression	0.025		0.054	
Log likelihood	3677.375		2467.474	
F-statistic	15.176		9.728	
Mean dependent var.	0.041		-0.031	
S.D. dependent var.	0.040		0.077	
Akaike info criterion	-4.454		-2.879	
Schwarz criterion	-3.829		-2.246	
a) Pedroni Tests (p):		0.0000		
b) Wooldridge AR1 (p):	0.0000		0.0000	
c) Granger Causality (p):	2.69E-07		0.0667	

(1980) period estimators, robust to within-cross-section serial correlation (Arellano, 1982). This means that our coefficient estimates are unbiased, even though they are not efficient; i.e., their standard errors are not as small as possible. But this very lack of efficiency means that, despite these p-values, we can be fairly confident about the signs on the estimated coefficients, and the levels of significance levels shown for those coefficients can be taken as highly conservative.

The results on Granger causality in row (c) are interesting. These show that while the Granger-causality of Log Real GDP on Log Velocity falls just short of standard statistical significance, Granger-causality in the opposite direction – Velocity on Real GDP – is very highly significant. Note that this result is also consistent with the pattern of significance for the coefficients in the two functional forms, in that both exogenous terms in the first column (L_Velocity) are highly significant, while only the second-lagged exogenous terms in the second column (LrGDP) is so.

On the overall question of whether GDP and Velocity are negatively or positively correlated, these results suggest that a simple answer is not possible. The co-integrating equation suggests that velocity should gradually fall as GDP increases over time. The short-term results, by contrast, show that GDP does not have an immediate effect on velocity (from the insignificance of the first lagged LrGDPma2 term in the 2nd column), but may over a slightly longer horizon (the second lagged term).

Increased velocity, on the other hand, is seen to have a small short term negative effect on GDP (with an elasticity of -0.06, and a longer term positive elasticity of smaller magnitude (elasticity of 0.03), a sort of diminishing ripple effect. Such diminishing effects over time are common, since changes would otherwise be explosively destabilizing.

Overall, therefore, we cannot give a simple answer to the question of whether increased velocity is everywhere and always positive for real GDP. We are forced to examine individual cases. Central banks both in the EU, UK, and the USA have created a lot of money in the current worldwide

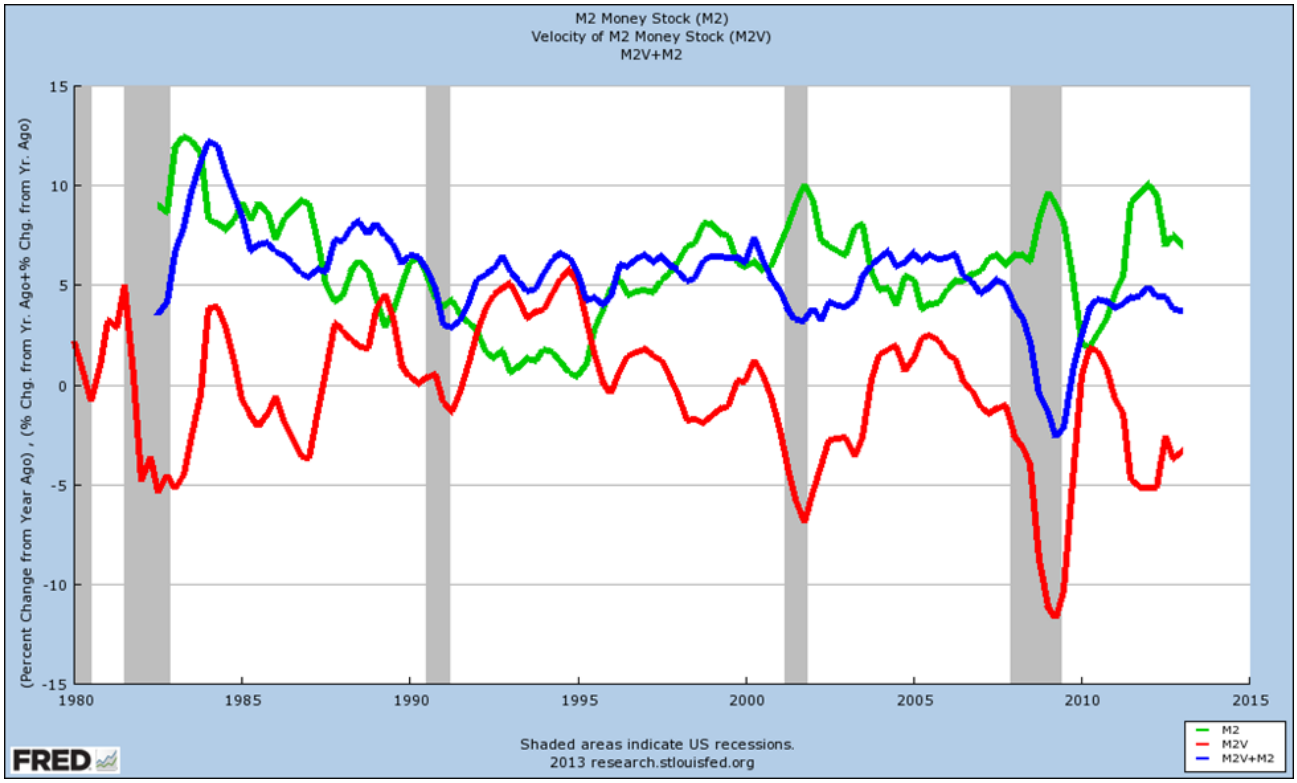

Figure 4 – Rates of M2 and M2 Velocity (M2V) of the US economy

recession. The so-called monetary base, consisting of cash and the central banks' deposits, has more than tripled in the US (Federal Reserve Bank of St. Louis (2014b), and increased by about 50% in the UK since 2007 (Bank of England, 2014).

Paradoxically, however, there has been an actual shrinking of private bank credit brought about by the credit crunch. This has continued longer than expected, and has offset the Money supply growth. This means that most of the money 'created' by quantitative easing is sitting in banks' reserves, rather than finding its way to businesses and consumers. This is shown by the ratio of official Bank Reserves in the US to M1, which is currently about 75%. Before 2008, it was at most 2 or 3%. (Federal Reserve Economic Data).

Note in Figure 4 that even though M2 Money supply (green line) increased during the 2008-2009 US recession (shown as shaded vertical bar), the Velocity (red line) decreased over the same period to the point where total Turnover (blue line) decreased.

However, shrinking private bank credit in the lending freeze brought about by the credit crunch has continued longer than expected has offset this. As a result, growth in total money the world over has been slow. This means that most of the money 'created' by quantitative easing is sitting in banks' reserves, rather than finding its way to businesses and consumers. This is shown by the ratio of official Bank Reserves in the US (Federal Reserve Bank of St. Louis, 2014c) to its M1 (Federal Reserve Bank of St. Louis, 2014d), which is currently about 75%. Before 2008, it was at most 2 or 3%. This is logic since new regulations worldwide have increased capital reserves requirements. Moreover, when quantitative easing reached businesses, it tended to be large companies rather than SMEs, therefore a recent recovery of stock markets rather than in employment rates (SMEs tend to be more labour-intensive, and tend to have less access to capital markets).

More velocity of circulation is more expenditures and purchasing power (your spending is my income, my spending is your income), therefore more production and employment.

In the following sections we will show several CCs in those countries (USA, Europe, Switzerland, and Brazil), and we will see their velocities compared to their national currencies velocities as well. As most of the CCs have near parity with their official national currencies, that is 1 CC ≈ 1 EUR/USD/CHF/REA, we think it is highly significant when a CC shows higher velocity than its official national currency. The question is: what does higher velocity in a CC represent? According to Stodder and Lietaer (2012) the countercyclical turnover of WIR Registered firms is driven by changes in Velocity. Thus, velocity of the CC might be impacted by the velocity of the official national currency: it might be countercyclical (as proved for the case of WIR), and it could be faster or slower, giving signs of its usage and utility. Again Lietaer's Equation Exchange Formula for dual-currency systems would be helpful to explain this.

Falling velocity is a result of an increased demand to hold money as opposed to a desire to expand productive capacity or borrow to make purchases. As well, falling velocity might occur if banks do not want to lend and consumers

and/or businesses do not want to borrow. The Central Bank can print, but it cannot determine where the money goes, or indeed if it goes anywhere at all. This is called "pushing on a string"

To counter the effects of falling velocity, one the motivations of CCS is to provide money (liquidity) in an alternative to the national currency to encourage new transactions. Velocity is then a measure (although not the only one) of its utility and fulfilment. Velocity of money can be understood as the efficiency of money in generating economic activity (GDP). That is, with a given money supply, more velocity of circulation reflects more efficiency of each unit of money in generating GDP. But the current monetary system is procyclical, as velocity slows down in periods of recession. However, it is in periods of recession when increasing velocity (efficiency of) money is needed the most. So increasing velocity is a way to counteract a recession. We focus on the velocities to compare the currencies and then try to grasp why they are different. This is the narrow scope of this paper.

3. THE CURRENCIES COMPARED IN THIS STUDY

The complementary currencies (CC) that are object of this study are: the WIR in Switzerland, the RES in Belgium, the Chiemgauer in Germany, the Talente in Austria, the Sol-Violette in France, the Bristol Pound in UK, the RES in Catalonia, the Berkshares in the USA, and the Palmas in Brazil. The velocities are calculated according to papers on the state of the art or by interviews we made by visiting the staffers of the currencies. A set of the profile of the currencies can be found in Rogers et al. (2012).

WIR, Switzerland. The robust annual turnover of the top complementary currency in the world, the Swiss WIR – Wirtschaftsring - Genossenschaft or Swiss Economic Circle) owes much to the business model of the dual WIR Bank that offers blended loans, based on the WIR and Swiss francs. For if, as a rule, the WIR and the Swiss Franc economies do not bloom at the same time, the growth of one can compensate for the stagnation in the other, as shown in Stodder (2009). As shown in its yearly report results (WIR, 2012), WIR is well established CHF/CHW 4.01 billion (with a 3.3% in all increase from 2011) but WIR participants generated turnover of 1.46 billion CHW in 2012, equivalent to a decrease of 6.0% compared to the previous year. This decrease resulted primarily from a domestic economy that was healthy and well stocked, as well as loan availability in Swiss francs at very low interest rates. The difference with the traditional WIR credit, granted on favourable terms - the real engine of the WIR system - can be understood from this perspective. Its velocity is 2.6 according to Stodder and Lietaer (2012).

Talente, Austria. This is an exchange ring plus circulating currency, i.e., a physical scrip, not just electronic credits and debits, a la the WIR. It is also named Z(w)EITgeld that means the "second money", situated in Vorarlberg in Austria, bounded on three sides by other countries (Liechtestein, Switzerland, and Germany), born in 1996 with 758 members that traded 293,000 Talentes in 2011. The velocity of the Talente is 4 according to Godshalk (2011)

RES, Belgium. This is a business exchange network, similar to WIR but without blended loans or a dual RES Bank. Born in 1995, over 5000 members and 100,000 consumers trade over 31 million RES a year, being 1 RES = 1 EUR. RES added business to consumer loyalty system and consumer to consumer transactions in 2003 but the core business remains business to business (RES, 2014). Its velocity is 1.9.

Berkshares, USA. Born in 2006, it is a loyalty scheme based on circulating money for the support of the local economy. 400 businesses accept the Berkshares, with a turnover of 512,472 Berkshares in 2011. 1 Berkshare = 0.95 USD. (Berkshares, 2014). Its velocity is 4.1

Chiemgauer, Germany. This is a circulating currency founded in 2003 in the Chiemsee, Bavary, Germany for the support of the local economy. The currency, 1 Chiemgauer = 1 EUR is Local fiat backed by Euros, with a demurrage fee of 2% per quarter (Silvio Gesell, the German-Argentine economist whose ideas inspired the founding of the WIR-Bank and Chiemgauer, had decades of international trade experience in Buenos Aires. Gesell's use of the term demurrage was borrowed directly from international shipping, where it denotes a reduction in payment to compensate for an unscheduled delay in the delivery of goods. Gesell applied a demurrage charge to the holding of money, with the aim of increasing its velocity. WIR-Bank originally applied such a charge, but eliminated it in 1948 (Stodder, 2009), electronic money compliant and microcredit loans. Its nearly 600 members traded 6,198,411 Chiemgauers in 2011 (Chiemgauer, 2014). Its velocity is of 11.3 according to Yasuyuki (2012)

Sol-Violette, France. This is a circulating currency as well, founded in 2011, serving the region of Toulouse in France. With 40.000 Sol ecos issued since 2011, it serves 80 businesses and 700 consumers (Sol Violette, 2013). It uses as well a sliding demurrage fee of 2% per quarter as well as Chiemgauer. Its velocity is of 4.49, according to its 2012 yearly report (Sol Violette, 2013),

Palmas, Brazil. This is a circulating currency, launched in 2003 (after the Bank of Palmas creation in 1998), that support the local economy, and microcredit loans in both national and local currency. Its velocity (estimation based on Rogers et al., 2012) is of 13.5

And there are included in the study two new currencies that started the late 2012 that are also included in the study because of their immediate impact of Bristol Pound, or being of interest as a replication of existing currency like RES.

Bristol Pound, UK. This is a new currency in Bristol, UK, that started on September 2012 devoted to local business development as a loyalty scheme based on circulating currency and virtual currency, and mobile payments. It serving 500 business that accept the Bristol Pound notes (259 of

Table 2- The 9 complementary currencies under study, ordered by monetary mass from high to low

	Velocity	National velocity as of 2012	Country	Ratio	Quality	Monetary Mass	Turnover per member/year	Turnover/year	Num. of biz	Charge % /transaction
WIR	2,60	0,60	Switzerlan	4,33	High	596.153.846	19.375	1.550.000.000	80.000	3,5%
RES	1,89	0,62	Belgium	3,06	Nice	16.763.188	7.562	31.758.340	4.200	7,0%
Talente	4,00	0,60	Austria	6,67	High	729.575	3.850	2.918.300	758	0,0%
Chiemgauer	11,30	0,60	Germany	18,83	Very High	550.442	10.453	6.198.411	598	5,0%
Bristol Pound*	0,79	0,65	UK	1,22	Low	163.600	501	129.836	259	0,0%
Berkshares	4,05	1,15	USA	3,53	Nice	126.399	1.281	512.472	400	5,0%
Palmas	13,50	1,25	Brazil	10,80	Very High	46.000	3.765	1.016.600	270	2-15%
RES Catalonia*	1,56	0,50	Spain	3,13	Nice	43.441	272	67.890	250	7,0%
Sol Violette	4,49	0,65	France	6,91	High	33.403	1.579	150.000	95	NA

Table 3 – Date of the measures and further features

	Velocity	Turnover/year	Date of Measure	Key Features
WIR	2.60	1,550,000,000	2011	Blended loans. Impact of 1.02% of Swiss GDP accounting blended loans
RES	1.89	31,758,340	2011	WIR-like
Talente	4.00	2,918,300	2011	Local taxes accepted in Talentes. It is supported by yearly member fees
Chiemgauer*	11.30	6,198,411	2011	Demurrage and 3% of consumer money-in is devoted to solidarity projects and blended loans
Bristol Pound	0.79	129,836	2013***	Local currency. Wide awareness. Local taxes accepted. Major payroll is in Bristol Pounds
Berkshares	4.05	512,472	2012	Loyalty scheme for Berkshire County, Massachussets
Palmas**	13.50	1,016,600	2011	Blended microloans and 5-20% salaries of public bodies are paid in palmas
RES Catalonia	1.56	67,890	2013***	RES-like with consumer focus.
Sol Violette	4.49	150,000	2012	Loans and grants in sols and demurrage

them accept the virtual currency) and over 160,000 Bristol Pounds are supplied. Its velocity is of 0.8 (April 2013).

RES, Catalonia. This is the RES currency started in a new country on October 2012, in Catalonia, in the kingdom of Spain. Being a unique system within RES, its approach is getting closer to Bristol Pound and Berkshares from the WIR-like origin, so that it is worthy of study as a new case of a community currency. It serves 250 members and has supplied 43,441 RES into circulation. Its velocity is of 1.56 (Note: in December 2014, its velocity had hit 3.1)

Table 2 includes the velocities of the nine complementary currencies compared to the velocities of the official money in their countries and Table 3 includes some other features, ordered from the biggest monetary mass to the smallest with data harmonized to 2011 with the exception of the two new currencies that are using data from April 2013. There are some currencies that run at higher velocities compared to their national counterpart.

From these tables we can see a variety of behaviours. In the following section 3 we will further dissect the properties of the currencies and we will compare groups of currencies to each other, by taking into account the relative velocities and the ratio of their velocity compared to their national currencies in their specific regions or nations (in the case of Euro) to have a clearer idea of some of their features and potential to give a boost to the real economy.

We consider a velocity is "fair" if it is equal to the velocity of the national currency in the main region or state of that CC, plus or minus a 20% threshold. A low velocity is the one that falls under that threshold, and a high velocity is that one higher than the threshold. In the case of going higher by a factor of 3 or more, we consider it a very high velocity.

Thus, Palmas run at very high velocity, Chiemgauer runs at high velocity, the Bristol Pound at a low velocity, while the remaining currencies run at fair velocity.

The method to make conclusions is twofold: compare the currencies first (Section 3) from the point of view of every feature (blended loans, demurrage, etc.), and then in Section 4 we compare the peer currencies and groups of currencies (Section 4).

4. DISSECTING THE SEVERAL COMPLEMENTARY CURRENCIES

The features we are going to compare the CC are the following:

- Commissions on transactions, sign up, renewal fees, and so on.
- Offer of blended loans
- Virtual currency or scrip or combined

- Convertibility of CC to a national currency (Dollar, Euro, Swiss Franc, Réais)
- Application of demurrage
- Collateral of CC in national currency and the possibility that consumers can buy it
- Others

It seems that having blended loans (loans in national and complementary currencies) like the cases of WIR, Chiemgauer, and Palmas has a positive influence on velocity. Microloans are offered by Palmas and presumably by Chiemgauer, and this might contribute to the highest velocity (see Table 4).

Being inclusive with several types of non-members participation, like the non-registered members of WIR or the consumers (prosumers) of Chiemgauer, Palmas or Sol–Violette can boost velocity as well.

Being virtual money does not seem to increase the velocity. WIR and RES are purely virtual and are much slower than the partly virtual Chiemgauer, while the partly virtual Bristol Pounds do not show signs of high velocity yet. On the other hand, the partly virtual Palmas, Sol-Violette, or the scrip portions of Chiemgauer and Bristol Pounds show vigorous velocity. On the other hand, scrip money might increase velocity as Berkshares, Chiemgauer, Talente, Bershares, Sol-Violette and Palmas all have notes and as a group have higher velocity than the purely virtual WIR and RES currencies.

Higher commissions might reduce the velocity like the case of RES with the 7% that leads to lower turnover member/year compared to WIR and Chiemgauer. Yet the 3.5% commission of WIR does not lead to the highest velocity compared to Chiemgauer with its 5% commission per transaction and a velocity that is 4 times higher than the WIR.

It might also be that those CC convertible to national currency, even at a loss of 5% to 15% like Berkshares, Talente or Chiemgauer have thereby kept their very high velocities.

The very high velocity of Chiemgauer is also distinguished by the 3% of Chiemgauer purchases earned in EUR being devoted to social affairs, to a community group of their choice.

It is also distinctive in the case of high velocity Palmas and Chiemgauer, that the staffers are paid a percentage of their wages in the CC.

Let us talk about the case of the demurrage that was designed specifically to accelerate transactions. It is implemented in the cashless Chiemgauer accounts with a fee of 0.02% per day (with a negative-interest-free period of 90 days) as well as the scrip and 2% demurrage every 3 months of the Sol-Violette. We might note here that boosting velocity was always the explicit purpose of demurrage, since it imposes an explicit cost on holding money (Stodder 2009, footnote 4 in page 4). The only schemes applying demurrage are Chiemgauer and Sol-Violette and this might have a positive influence in the velocity, compared to their respective peer currencies like Talente for Chiemgauer and the new currencies of Bristol or RES Catalonia for Sol Violette. Note that a modest rate of inflation, such as the 2% annual rate which is given as an explicit target by most of the world's leading central banks, accomplishes much the same thing as a formal demurrage system.

The reasons behind demurrage are safeguarding and stimulation of the money circulation in order to generate more local business: "Money that never slows down circulation"; "The advantage is that everybody keeps money going"; "The velocity of money or the speed of money is faster." Demurrage or other ways to safeguard the circulation is promoted by the German Regiogeld-Association. Every initiative, supported by members of the association, is committed to quality. One of the initiatives is to support a sustainable financial system by determining and controlling the amount and velocity of the money issued.

From the point of view of the Chiemgauer, the following considerations come up: Chiemgauer is not only backed by euros but also by powerful ideas and strong personal commitment, deeply inspired by the ideas of Christian Gelleri and with a view on the need for concrete and grassroots projects growing organically through the creativity of individuals and groups. They have to be useful for the participants and they have to be both idealistic and pragmatic. The economy is like a dynamic bloodstream that means that if money does not flow then the economy is in pain. The first aim was to bind the money and let it flow within the community. Binding purchasing power, as marketing experts would say. Other objectives were to foster cooperation, strengthen the local economy, increase sponsorship for non-profits, reduce food transport, reduce money speculation and increase regional investments.

The velocity of the Chiemgauer is estimated at 11.3 (See Chiemgauer-Statistik 2003-2009 of Chiemgauer e.V. made by Christian Gelleri). The velocity of the cashless Chiemgauer could be measured exactly whereas the velocity of the paper money is). It is a very fast velocity, compared to the other CC of this study, and is 2.55 faster than the Euro (Yasuyuki 2012), even with a relatively small turnover of 10,453 Chiemgauers per member and year compared to WIR. Demurrage seems to be key to this high velocity. Its velocity is showing to be much higher than the velocity of conventional money, which is approximately 2.77 in the German area of the Euro.

The Chiemgauer is the second best documented currency (after WIR, perhaps), and we see its velocity skyrocketed to 20 in 2006 while it is now stable around 11 (see Figure 5). It seems that the introduction of the virtual currency in 2004 increased the velocity but its effect got diluted along the years coming back to nearly the same velocity of pure

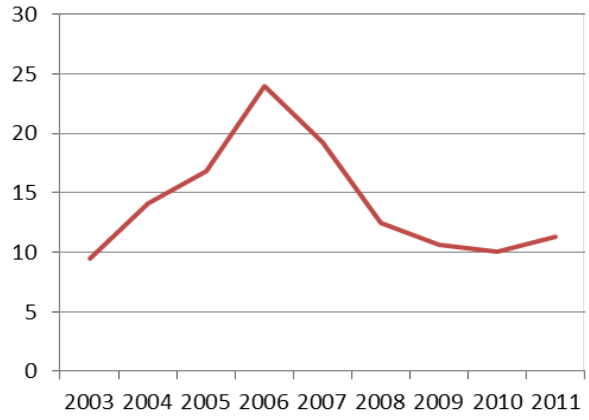

Figure 5 – The velocity of Chiemgauer (2003-2011)

scrip based transactions in 2003. As size matters, it also seems that the continuous growth of the number of members and transactions of the Chiemgauer has reduced the velocity, yet to a level that is unbeatable by the peer currencies.

With demurrage, money expires, and it seems that this has the advantage that everybody keeps money moving. But the very same idea for RES (and presumably WIR) members might seem highly unacceptable. Today, strong positions against and in favour of the demurrage are being maintained.

These features and others are compared in the following table 4. The columns are grouped in the following groups: Approach and mission, the supports for running the CC, the business model behind, the inherent features of the CC, and a final group of others that tell us other framework factors like awareness, whether people forget about the currency once they start trading each other or the relative volume of transactions.

As a curiosity, Godschalk (2011) reported the velocity of three scrip currencies in the USA with incredibly high velocities that go up to 60. In Table 5, the evaluation of velocity is possible for the stamp scrip issued during the Great Depression in Santa Cruz (California), Okmulgee (Oklahoma), Mason City (Iowa) and Carmel (California) in the USA.

Quoting Godshalk (2011), the scrip issued in Mason City was hybrid (time- and transaction-based). Analysing its velocity the results are comparable to the transaction-based only scrip issuances. Although the transaction tax was 50% higher (3 ct. compared to 2 ct.) the velocity of the Okmulgee scrip accelerated to almost 100 almost twice as high as Santa Cruz or Mason City. During the Great Depression the velocity of the dollar (in Godshalk's paper this is calculated with M1) decreased dramatically from 3.42 (1929) to 2.19 (1933). A velocity of transaction-based scrip of 50 or more indicates that this kind of local scrip worked very well in these areas compared to the striking conventional money during this crisis. There are no hard facts available about other local scrip.

This fact makes us wonder about the decisive contribution of consumers to speed up the velocity of the currency between businesses or simply it is because scrips run smooth in deep crisis. Let us analyse the cases of Bristol Pound and RES.cat, a branch of RES in Catalonia, where the departing model was B2C. In the first 5 months of its existence from November 2012 to March 2013 there were 67,890 RES in turnover, with a velocity of 1.56 out of a money supply from consumers of 35,479 RES that represent the 81.7% of the total monetary mass. This means that consumers contribute with velocity at least of 1, but then merchant and businesses need to activate their mutual purchases to reach the full higher velocity of the currency. This information is depicted in Table 6.

Let us see the Bristol Pound with a similar scheme. It is a new UK CC backed entirely by Sterling Pounds with local yet remarkable world-wide awareness, combining scrip and virtual currency. The online currency belongs to businesses and is convertible back to Euros, and a bonus of 5%

Table 4 – Comparing the features of the several CC

Features	Approach - mission					Supports				Business Model	Features of the CC									Others			
Velocity Currencies	Mutual Credit for Purchase	Blended loans	Fiat currency-backed of (part of) the CC	Loyalty Scheme (B2C prevails over B2B)	Income partly goes to social actions	Staff paid in CC	Professional Management	(local) bank or union participation	With the support of public grants of public bodies or donnors	Commissions	Membership (annual) fees	Sign up for new members	(Local) taxes accepted in CC	Grants or prizes in CC for public help	Demurrage	Scrip (paper, notes)	Virtual	Mobile / Smartphone payments	Convertible back to fiat currency	People forget the CC after knowing each other and they shift to trade in fiat currency	Wide Awareness	Size (number of members and volume of transactions)	Currency
1.6 **RES Catalonia**	yes	no	yes	yes	no	yes (10%)	yes	no	no	7.0%	yes	no	no	no	no	no	yes	no	no	NA	no	very small	RES Catalonia
1.6 **Bristol Pound***	no	no	yes	yes	no	not paid	!no	yes,credit union	yes,donnors	0.0%	no	no	yes	no	no	no	yes	yes	partly (virtual is)	NA	yes	very small	Bristol Pound*
1.9 **RES**	yes	no	no *	no	no	yes (10%)	yes	no	no	7.0%	yes	yes	no	no	no	no	yes	no	no	perhaps	no	very big	RES
2.6 **WIR**	yes	yes	no	no	no	NA	yes	it is a bank	no	3.0%	yes	NA	no	no	no	no	yes	no	no	NA	yes	huge	WIR
4.1 **Berkshares**	no	no	yes	yes	no	not paid	no	yes,local bank	yes,donnors	5.0%	no	yes	no	no	no	yes	no	no	yes (5-10% loss)	yes	no	small	Berkshares
4.5 **Sol Violette**	no	no	yes	no	yes	NA	partly	yes	yes,city	NA	yes	NA	yes	yes	yes	yes	NA	no	yes (5% loss)	yes	no	very small	Sol Violette
5.3 **Talente**	yes	no	yes	yes	no	yes (50%)	no	no	no	0.0%	yes	yes	yes	yes	no	yes	yes	no	yes (15% loss)	yes	no	big	Talente
11.3 **Chiemgauer**	no	no	yes	balanced	yes	yes (50%-100%)	yes	yes	no	5.0%	yes	yes	NA	yes	yes	yes	yes	no	yes	no	no	big	Chiemgauer
13.5 **Palmas**	no	yes	no	no	no	yes (20%)	yes	it is a bank	no	2-15%	no	no	yes	no	no	yes	NA	no	no	NA	no	small	Palmas
	Approach - mission					Supports				Business model	Features of the CC									Others			

NA - Data about it Not Available

* pilot group with few hundreds of consumers from 2011

** = needs verification

Location	Santa Cruz	Okmulgee	Mason City	Carmel
State	California	Oklahoma	Iowa	California
Type of stamp scrip	tx-based	tx-based	hybrid	tx-based
Total issuance (No. Of 1-Dollar-notes)	1,050	3,000	10,000	1,200
No. Of samples	76	66	44	21
Samples in $ of total	7.20%	2.20%	0.40%	1.80%
First day of issuance	April 11, 1933	Feb 1, 1933	May 6, 1933	Feb 2, 1933
Last day of issuance	June 10, 1933	Apr 1933	July 1, 1933	July 28, 1933
Total stamps needed	50	35	52	36
Transaction fee (USD Cents)	2	3	2	3
Av. No. Of Transactions	48.7	32.5	52	32.6
Av. No. Of days of circulation	365.9	204.6	320.1	229.8
Av. Sales turnover per year (USD) = Velocity	51.8	97.1	60.6	56.6

Table 5 – Velocities of stamps scrip of several CC in the 30s Godshalk (2011)

for the first 100.000 Bristol Pounds supply was given after the first 5 months of existence. Businesses voluntarily offer discounts paid with Bristol pounds. Money supply as of March 2013 was 163,600 Bristol pounds as follows: 66,800 BP in notes + 96,800 virtual BP (in online accounts). The payment online (txt2pay) happened with 42,284 BP (10,720.08 Bristol pounds in March only) as well as 15,497.17 BP paid to the council (only virtual payments in total in the six months). There are pending estimates of the payments done online (with online banking) and the estimates of payments with the notes. There are 259 business? accounts (with accounts and over 500 businesses in total accepting notes) and 687 individuals from October to March. In turn, 5 part-time staffers contribute with 2-3 days a week (partly) paid by grants (philanthropy). The BP case, similarly to the RES Catalonia case, faces a strong barrier from shop-keepers to change their behaviours towards buying local, claiming that they lack proper local providers. In the two cases, it seems that having consumers buying local puts pressure on the businesses unless they share the vision of the greater good, working together to cooperate to survive or do better.

In the end, it is not clear at all that having consumers in addition to businesses speeds radically the velocity, yet it might contribute with 1. In any case, it increases the awareness and pressure to adopt the CC, which indirectly will contribute to higher velocity.

5. FINAL COMMENTS AND ASSESSMENTS

Peer currencies were divided in three groups: A) Talente Sol-Violette and Chiemgauer, B) Berkshares, Bristol Pound, and RES Catalonia, C) RES, WIR, and Banco Palmas. The categories are A, B, C that roughly reflect different approaches and missions, being A regional, B local, and C businesses oriented.

So the qualitative analysis with ensuing suggestions is as follows:

- It does not seem that commissions restrain the velocity of the CC, because the cases of the Chiemgauer and Palmas have commissions of over 5% compared with the 3 - 7% of the WIR and RES
- It doesn't seem either that yearly maintenance costs restrain the velocity.
- Size might matter: the highest velocity is achieved by less than 1,000 members in groups A and B. Small is beautiful?
- Professional management might (must) help: Chiemgauer outnumbers its peer Talente. On the other hand, there is no evidence that it makes a difference in the WIR, RES or Palmas. It is possible that it may have an effect on the scale of the currency: being run by professional staff, WIR, RES, and Chiemgauer have the highest amount of members

Table 6 – The case of RES Catalonia, and its analysis of the money supply, sales, and velocity

	2012	2013					
	November	Desember	January	February	March	TOTAL	
Num. of transactions	1,362	1,400	1,455	1,649	1,106	6,972	
Sales	10,894	16,789	13,462	12,261	14,485	67,890	
Acc. Sales	10,894	27,683	41,145	53,406	67,890		
B2C money-in EUR	3,410	6,850	1,511	5,440	2,260	19,471	
B2C money-in RES	6,342	12,256	2,132	11,212	3,538	35,479	81.7%
B2B money-in RES	1,510	1,414	1,767	3,270	0	7,962	18.3%
Total money supply RES	7,852	21,522	25,421	39,903	43,441	43,441	100.0%
Velocity	1.39	1.29	1.62	1.34	1.56	1.56	

and volume of transactions. The causality might run the other way, however, from size to staffing, because only the bigger currencies can afford to hire professionals.

- Staff being partly paid in CC might help to enhance trust in the currency, and disseminate first class knowledge of its use. The same case occurs with Chiemgauer and Talente.

- Does B2C boost the velocity? Good question, yet it might be true for the case of Chiemgauer and Sol-Violette, compared to Talente. Velocity is reasonable in the case of Berkshares, but it is unclear in the new born Bristol Pounds and RES Catalonia experiences. Stodder (2012, Table 3) shows that in all industrial and commercial sectors, the velocity of WIR is higher for smaller Registered than for larger Non-Registered clients. He models this as small businesses being more constrained by the scarcity of cash and credit in their national currency, and thus eager to substitute WIR for that currency. This same constraint and resulting velocity is likely to hold for most consumers.

- Blended loans help: This seems to be a velocity accelerator, as one sees an increase of 0.7 in the velocity of WIR when compared to RES, and the velocity of Palmas is 1.8 greater than Chiemgauer.

- Sense and pride of belonging might help: Chiemgauer devotes 3% of B2C money to social actions.

- It is unclear whether the support of the local government helps or not. There are a couple of currencies with strong local or regional governments' involvement as the case of Toulouse with Sol-Violette and Bristol with Bristol Pounds. However, it surely helps to sustain the early sustainability of the currency. We might note here that the special status of government-issued currencies (fiat or otherwise) as the sole legitimate means of payment for taxes or fines was crucial to their universal acceptance as money. This was the case, for example, with the "tally sticks" that became money in Medieval England, through their payment to the Exchequer, as shown by Glyn Davies in the History of Money (2005: 147-153). It is similar to the experience of the Talente and Bristol Pounds: local taxes can be paid with the CC.

- In the same way, it is unclear whether the support of a Bank has an impact. Palmas is top for velocity, but WIR is a bank as well and, anyway, its speed is low.

- In relation to demurrage, Chiemgauer and Sol-Violette are the only ones with this monetary property. Chiemgauer is the most reliable case, and it is worthy of consideration that it runs with a higher velocity than its peers, the Talente or Berkshares.

- Does scrip run faster than virtual money? It is not clear. It is true that the cases of the purely virtual currencies like WIR and RES show low velocity even compared to the rest of currencies that work with notes totally or partially, perhaps with the exception of Chiemgauer.

We have thus detected possible drivers for higher velocity in complementary currencies, being not only demurrage the factor boosting the velocity but a proper combination of utility and sense of belonging achieved by useful blended loans, a strong base of B2B members with some consumer involvement, and perhaps the intelligent combination of scrip and virtual money. In turn, size might matter in the sense that it seems apparently beneficial to strike a balance: not too small that is may not have sufficient critical mass but not too big either, where the sense of belonging might get diluted. On the other hand, there is no clue that public bodies or bank branches support encourage higher velocities. Having prosumers or non-registered members (in the case of WIR) seems to boost velocity in a well leveraged and healthy network of member companies.

As said, velocity is not all in a complementary currency, but just a sign of its lively utility and health, and the ground for its sustainability.

Our final comment on December 2014: Bitcoin and cryptocurrencies appeared as early as 2008 and since then they have attracted a lot of interest. One interesting fact is that in 2014 Bitcoin hit the velocity of 36! Certainly, there is long way to understand how a currency runs at high velocity, which well deserves an extension of this paper in a future study to be published.

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