

## The Cradle Will Rock...

Dori Levanoni

There is a desk toy that is found on many office desks in the World which, when we describe it, should be familiar to most (if not all) of our readers. The toy is composed of an odd number of steel balls (five, most typically) just touching each other in a line, each suspended by a pair of wires from a frame. The “game” is to pull back one (or more) balls and release it so that it hits the stationary ones. We then get to watch as one (or more) balls rebound from the far side of the line, back and forth.

That desk toy is known as “Newton’s Cradle”, and is often used for education as much as entertainment. It is often shown to first year physics students to demonstrate the two laws of Conservation of Energy and Conservation of Momentum. Essentially what it is doing is demonstrating, via clearly observable phenomena, some fundamental “laws” of the Universe.

One is often left wondering, however, “How do the steel balls ‘know’ the laws?” In other words, by what mechanism does Newton’s Cradle actually work? That’s where the details really matter!<sup>1</sup>

### Talking Spheres...

When we do look at those details, what we find is that there effectively a conduit by which information can be transmitted from one ball to another. That conduit is formed by the physical contact of each ball with the next (and previous) ball(s). In some cases, the contact exists for only an instant (perhaps a few tens of milliseconds), but the time is long enough for the “information” to be transmitted.

In other words, the balls “know” the laws because of the microstructure of the interaction of one ball to the next. Now, there are still further laws underpinning those interactions<sup>2</sup>, but for the purposes of studying the macro interaction (i.e. the one

of the whole Newton’s Cradle), we’ll assume those are simply true.<sup>3</sup>

And so, the physics of Newton’s Cradle really does, in the end, give us a demonstration of the two conservation laws at work.

### Do Currencies “Rock”?

As promised, we did want to connect both our fairly “theoretical” discussion of Newton’s Cradle and those two “laws” of physics with the financial (particularly currency) markets.

Much like the Universe, the Currency Markets have a few “laws”, though in their current form they do not appear to be nearly as “strong” as the laws of Conservation of Energy and Momentum are for the Universe<sup>4</sup>. A few of them are:

- The Law of One Price
- Uncovered Interest Rate Parity
- Covered Interest Rate Parity

And others.<sup>5</sup>

This FX Monitor will be the start of an occasional series on how the FX markets “know” those laws, just in the same way that the balls of Newton’s Cradle “know” the two conservation laws. And, much as we discovered for the Cradle, there are definitely “micro” reasons why the currency markets appear to obey their own laws.

And our first contestant is...“The Law of One Price”. So sit back, relax, get out your #2 pencils, but rest assured that, unlike most introductory physics classes, there will be no pop quizzes!

<sup>1</sup> For “a semi-conceptual analysis of the toy called Newton’s Cradle”, please see <http://www.lhup.edu/~dsimanek/scenario/cradle.htm>.

<sup>2</sup> Funny ones like the Pauli Exclusion Principle, and not so funny ones like Special Theory of Relativity, etc.

<sup>3</sup> We really are going to make a point about financial markets eventually, where there are also such “micro laws” at play as well. For example, “if there are more buyers than sellers, prices will rise”, etc. We will also, at the appropriate time, take it as given that such “micro laws” are “true” in the financial markets.

<sup>4</sup> There are “allowed violations” of both those laws of physics, which is in turn the result of another “law” of the Universe, called the “Heisenberg Uncertainty Principle”. It is simply that the scale of those violations is much larger for the “laws” in the Currency markets than for the aforementioned laws of physics.

<sup>5</sup> Far be it from us to say this is an *exhaustive* list, for which we might suggest one of the many Macroeconomics textbooks out there. We might also note that economists appear to have as much “fun” naming their laws than physicists do (take ‘Siegel’s Paradox’, for example).

<sup>6</sup> We will go into the other “laws” in later FX Monitors.

## Trading for a LOOP...

The first “law” in the currency markets we will cover is the “Law of One Price” (i.e. LOOP).<sup>6</sup> In its simplest form, the law states:

“... absent natural or government-imposed trade barriers, a commodity should sell for the same price everywhere (when prices are measured in a common numeraire).”<sup>7</sup>

In other words, the price of a good that is the same in two markets (for example a McDonald’s Big Mac) should be, when priced in a common currency, the same in both markets.<sup>8</sup>

When we looked at Newton’s Cradle, we were able to identify (within certain limits) the mechanism by which the Cradle worked (i.e. demonstrated the two conservation laws). What’s the equivalent for the Law of One Price?

Trade.

Simply put, since there is a large global trade in goods and services, there is a mechanism by which the information (i.e. price and exchange rates) can be communicated from one market to another.

Specifically, the “microstructure of the interaction” is that, since arbitrage conditions shouldn’t exist in freely traded commodities because of the natural supply-demand balance equation, any situation that creates the appearance of a “risk-free arbitrage” should be arbitrated away.

Thus, if Big Mac’s are much less “expensive” in one market than another (once a common currency is used), one could buy Big Mac’s in the “cheap” market, sell them in the “expensive” market, and convert the proceeds back to the original currency for a “free profit”.

Since that would qualify as a “risk-free arbitrage”<sup>9</sup>, the markets should respond in such a way as to neutralize it. In other words, either the local price of Big Macs should rise in the “cheap” market (or fall in the “expensive” one), or the currency of the “expensive” market should fall relative to the “cheap” one.

Note that all the trades necessary to earn that “risk-free arbitrage” will, if no other market participants are trading, force all the above price/exchange rate changes.

## Trading Lots...or Lots of Trading?

In order for LOOP to “work”, there must be a lot of trading (otherwise those “other market participants” can create apparent violations of LOOP). So, how much trading is there in the World?

As of the end of 2005, in the developed markets<sup>10</sup>, we saw just around US\$10 trillion<sup>11</sup> in annual cross border trade in goods and services. That’s in the context of a global GDP of around US\$40 trillion. In other words, around 25% of the World’s GDP trades cross-border. That is large enough for the LOOP to “work”<sup>12</sup>!

The reason why it doesn’t *always* work is that there are many “other market participants” trading, who can, because of their own “laws”, move currencies around.

In Newton’s Cradle, we apparently see both conservation laws followed simultaneously, and yet in the currency markets we apparently see the laws followed not simultaneously. Why?

## The Cradle Will Rock...Eventually

There are, in fact, violations of the two conservation laws that occur which means that they may not be followed simultaneously. The reason it doesn’t appear so is that the amount of time those violations are allowed to last is, in general, very small. We simply are not fast enough to see that the Conservation of Momentum and Conservation of Energy are both always “working”.<sup>13</sup>

In the currency markets, the amount of time that one law can be violated<sup>14</sup> can be much longer—long enough, in fact, to see it easily! The key here is to recognize that:

1. LOOP doesn’t have to “work” at all points in time.
2. There are other laws at “work” at the same time.

We’ll go through those other laws in forthcoming Currency Monitors, but it is the combination of those two facts that explains why we, as an active currency manager can still use, quite successfully, LOOP models (i.e. PPP models), even though we don’t plan on waiting years for the models to “work”!

<sup>7</sup> Obstfeld, Maurice and Rogoff, Kenneth (1996), *Foundations of International Economics*. Cambridge, MA: MIT Press. pp 202.

<sup>8</sup> Violations clearly occur to this “law”, as our recent “Big Mac” update shows. May 2006 First Quadrant Currency Monitor, “Let’s Get a Quick Bite at the Exchange”.

<sup>9</sup> We’re clearly ignoring shipping costs, taxes, labor costs and the possibility of pirates...

<sup>10</sup> As MSCI defines them.

<sup>11</sup> That’s “billion” to those of you in the United Kingdom.

<sup>12</sup> Which is the same thing as saying that “Purchasing Power Parity” works.

<sup>13</sup> Which goes back to the “Heisenberg Uncertainty Principle”.

<sup>14</sup> We could call this the “First Quadrant Uncertainty Principle”, but we won’t.

## Returns and Expectations

Half of the countries that we follow raised rates during June, continuing the general trend of increasing rates around the world. Denmark, the EMU, Norway, Sweden Switzerland, and the United States all tightened monetary policy. The remaining central banks either made no policy changes or did not meet.

The US 14bp increase led the countries we follow to an average 8bp cash yield increase. New Zealand (-8bp) was the only developed country with a freely floating currency that had cash rates decline.

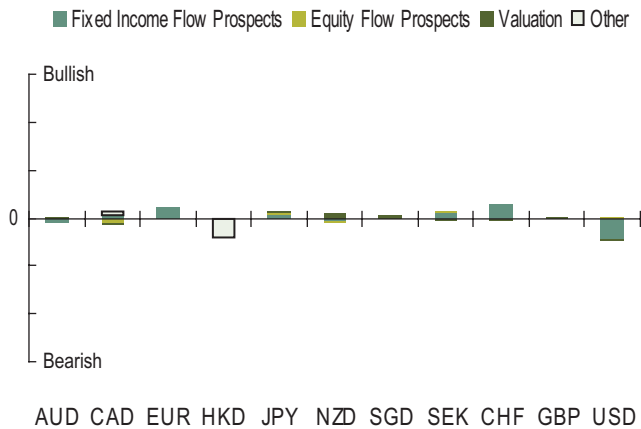
Bond yields almost uniformly increased in June. The only holdout was the US (-3bp). Canada (19bp) and Sweden (19bp) increased the most. Overall the average increase was nearly 10bp.

The equity markets were mixed during the month. UK had the largest gain (+1.91%), while on the down side New Zealand (-2.58%) had the largest loss. The average market barely increased by 0.17%.

Only the SEK (1.26%) and USD (1.09%) significantly appreciated during the month. On the other end of the spectrum, the NZD (-2.97%) depreciated while all other currencies have moved less than 1%.

### Change in Factor Contributions to Forecast

(May 31, 2006 to June 30, 2006)



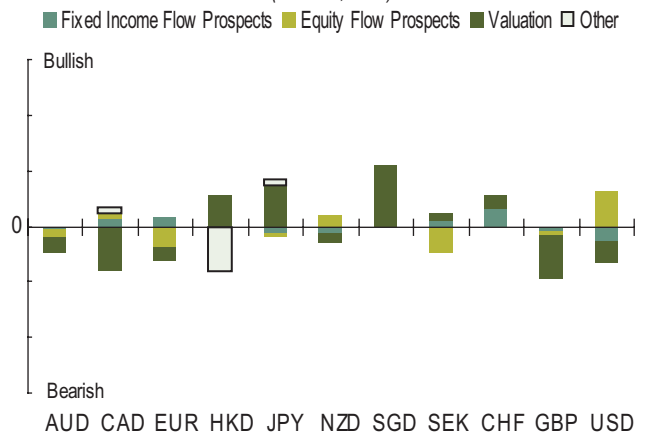
Source: First Quadrant, L.P.

The Japanese yen remains the most undervalued currency and is again followed by the Swiss franc and the Swedish krona. Also as was the case last month, the UK pound and Canadian

dollar are the most overvalued currencies in the developed markets. The most attractive destination for equity capital remains the US, and the Euro zone and Sweden are the most likely sources of that capital. Bond flows prospects are growing and slightly favor Switzerland and should lean away from the US. Cash flow prospects slightly disfavor the UK and New Zealand but remain small.

### Factor Contributions to Forecast

(June 30, 2006)

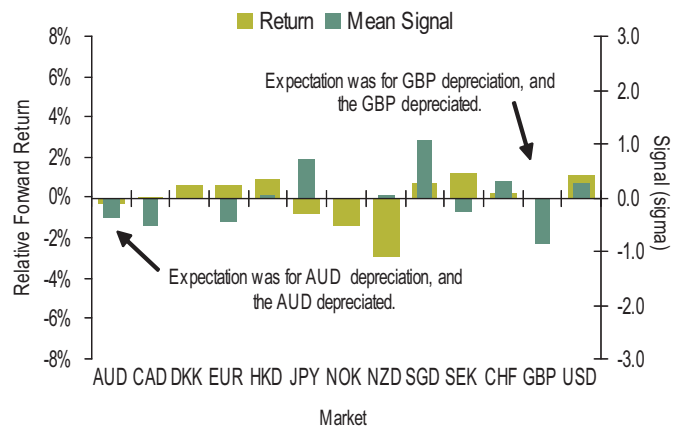


Source: First Quadrant, L.P.

Our currency strategy continued having difficulties in June. These losses were most pronounced in the long Japanese yen and New Zealand dollar positions. The long US dollar position did have a strong month lessening the overall loss for the month.

### Currency Returns and Expectations

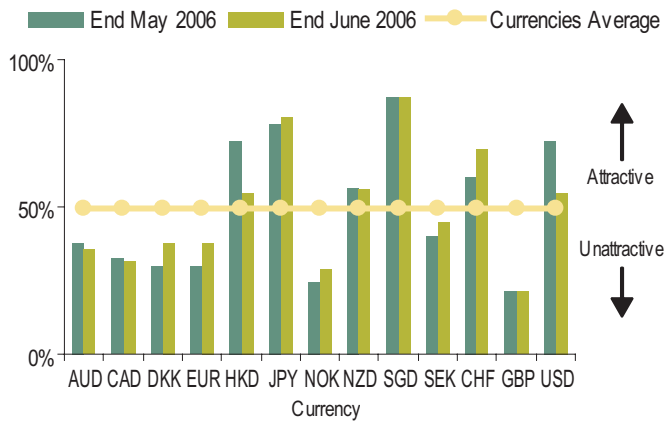
(June 2006)



Source: WM/Reuters, First Quadrant, L.P.

The Japanese yen remains our longest position and the UK pound remains our shortest position. The notable changes in position during the month were shrinkages in the long US dollar and short Swedish kronor positions as well as increases in our long New Zealand dollar and Swiss franc and short Australian dollar and UK pound positions.

### First Quadrant Currency Attractiveness



Source: First Quadrant, L.P.

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