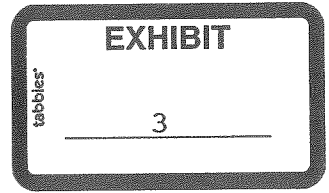
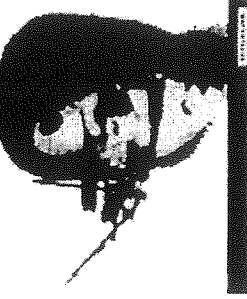


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Randolph Harrison
LINDEN RESEARCH, INC.



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Tuesday, February 20, 2007

The Linden dollar Game

On Schemes Resembling Objects of Intersecting Trilateral Sides upon a Polygonal Base



In a previous article I asked some very tough questions about the Second Life virtual economy. That article provocatively proposed a case as to why I believe Second Life's much hyped economy resembles a pyramid Ponzi, or more accurately a type of high yield investment program (HYIP) scheme. After posting that article I was partially convinced by many respondents that Second Life probably is not a Ponzi scheme as a precise legal definition -- at least probably not in most jurisdictions. Indeed, after learning more about HYIPs, and in particular HYIP Games, Second Life and the game's system of "virtual currency" satisfy many of the attributes of such schemes. More about HYIPs later. First, some background:

Brief Background

I covered the background of Second Life in some detail in my previous article. Second Life is a type of online computer game often referred to as a *Virtual World*. Virtual Worlds, while marketed as computer games and produced by computer game developers, are thought by many to represent the natural evolution of the web. In fact, there are probably myriad noble and interesting applications of Virtual Worlds to things like education and community collaboration.

What I am concerned about here is *only* the



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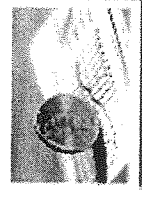
[Adam M. Brandenburger: Co-Opetition : A Revolution Mindset That Combines Competition and Cooperation : The Game Theory Strategy That's Changing the](#)

virtual economy or virtual marketplace aspect of Second Life. It is the claims of real gold in the Second Life virtual hills that has caused most of the recent media hype around the game. The makers of Second Life, [Linden Research](#) (privately held; San Francisco; funded by [Benchmark Capital](#) et. al., "Linden Labs", "LL") themselves actively encourage this view of Second Life, judging from self-promoting links on Linden's own [official Second Life website](#):

- [Second Life: It's not a game](#) Fortune's David Kirkpatrick reports on why IBM's Sam Palmisano and other tech leaders think [Second Life could be a gold mine](#).
- [I got my job through Second Life](#) Looking for work? Your best bet may be an interview in virtual reality. Fortune's Katie Benner explores the cutting edge of corporate recruitment.
- [Starting a Second Life Business](#) Find out what entrepreneurial opportunities the virtual world of [Second Life](#) has to offer.

Where There's Smoke...

In that now infamous article I concluded that Second Life's supposed economy wasn't a whole lot more than a typical pyramid scheme, where most of the money paid in by new recruits ends up realized by the organizers and a handful of early entrants. I was promptly assured by any number of the Second Life faithful that I was wrong, and that there were literally thousands upon thousands of real, financially valuable businesses making money, providing jobs, growing at astonishing rates, and redeeming their virtual Linden dollars (L\$) for real money.



I challenged the Second Life community to offer forth a typical, average business for quantitative financial analysis. In fairness, a handful of apparently honest folks came forward with offers to participate; even one of the most well-known of the "virtual oligarchs" (one of those in the handful of players at the top of the virtual economy) signaled some interest in the project.

Things took a hard turn when I was forced to cancel that project along with most of my Second Life public discussions and debates. Perhaps I can discuss the particulars later, but suffices for now to say that many in the Second Life community have zero tolerance for critics and criticism.

Nonetheless, I did become more curious after the severe anti

[Game of Business](#)

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[Cliff Ragsdale: Spreadsheet Modeling and Decision Analysis](#)

[David Besanko: Economics of Strategy](#)

[John C. Hull: Options, Futures, and Other Derivatives \(5th Edition\)](#)

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[Kenneth M. Morris: The Wall Street Journal Guide to Understanding Personal Finance, Fourth Edition](#)

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[Piet Sercu: International Financial Markets and the Firm \(Current Issues in Finance\)](#)

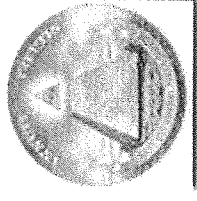
[Richard A. Brealey: Principles Of Corporate Finance \(McGraw-Hill/Irwin Series in Finance, Insurance, and Real Estate\)](#)

reaction I received. Especially so when even seemingly objective researchers and academics took a see-no-evil attitude, dismissing my analyses without serious treatment.

Even though I played the game myself on and off for more than two years, up until the middle of last year, I was still surprised. The economic part of the game was always there, but never as a source of practically religious devotion. *What the hell is going on in Second Life?*

Redeemable Virtual Tokens

The L\$ is often referred to as a virtual currency. In fact, it is not a currency at all. It is a micropayment token system. I have been around micropayment systems for many years in their application to mobile phone carriers. *The Economist* (Feb. 17, 2007) features a cover story that includes discussions about micropayments vis-à-vis digital cash.



Most justifications for why Linden Research had to create the L\$ center around micropayment issues. In reality, telecoms, Apple iTunes, Microsoft, and others have proven that floating an independent currency is not requisite to enabling a functional micropayment system. I myself am partial to the iTunes batch-billing approach, keeping payments denominated in real currencies. Even the more prepaid-credit approaches taken by Microsoft in the Xbox Live Marketplace avoid the complications of currency management introduced by independent, pseudo currencies like the L\$.

Regardless of the reasons, the fact remains that the Linden dollar is *objectively not a currency*. In Linden's Terms of Service agreement, sections 3.3 and 5.3, Linden clearly states that players have no financial or legal claim to their L\$, and that L\$ are a consumable entertainment product which can be revoked or deleted at any time, without reason. Not quite up the standard of a fiat currency.

But Linden Research does promote, market, and manage the L\$ as if it were a legitimate, independent fiat currency. They operate an official "virtual currency exchange", the LindeX, on which players can either buy L\$ with real money or redeem L\$ for real money deposits to their PayPal or bank accounts. And the redemption rate, or as they call it "exchange rate" implying the Forex equivalent of that term, *is floating*.

[Richard L. Smith:
Entrepreneurial Finance](#)

[William Easterly: The Elusive
Quest for Growth : Economists'
Adventures and Misadventures in
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[James Carey: SanFrancisco
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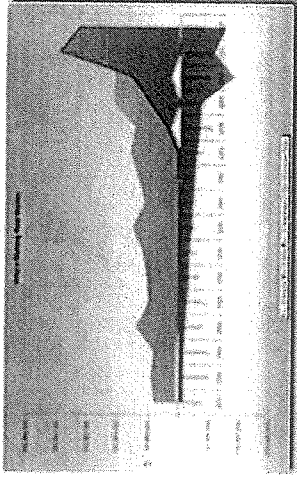
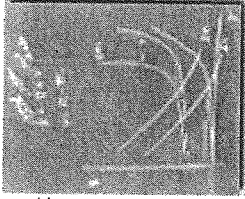
The [Wiki on the Linden dollar](#) asserts (emphasis added):

Residents may purchase L\$ directly through the client, or convert between Linden currency and U.S. currency through either Linden Lab's currency brokerage, the [LindeX](#) Currency Exchange, or other third-party currency exchanges. The ratio of USD to L\$ fluctuates daily as Residents set the buy and sell price of L\$ offered on the exchange, and fluctuated between L\$240/USD and L\$350/USD between October 2005 and September 2006.

Virtual Interventionists

There are all kinds of macroeconomic tangents I could take at this point. Without straying too far, we can safely say that Linden Research has taken on the role as "virtual central banker", and "virtual treasury", in minting and distributing their own "virtual currency". (The Second Life economy is built upon a system of "sources and sinks" which, while sometimes cited as a monetary control lever, really more represent the virtual economy's fiscal policy.)

The exchange rate is not freely set by supply and demand; it is not a floating exchange rate. In recent months, Linden Research has sold relatively large amounts of L\$ themselves on their own LindeX market.



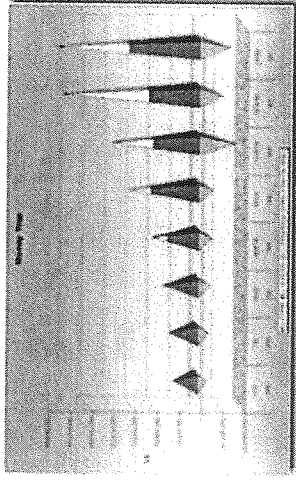
Clearly a form of [seigniorage](#) (selling newly minted currency for net revenues), Linden claims they do this in order to manage L\$ / \$USD volatility. In other words, they want to keep the redemption rate stable, right around the L\$250-L\$300 per

William H. Press: Numerical Recipes in C: The Art of Scientific Computing

SOFTWARE BLOG (BETA)

\$1USD range. Currency intervention.

More economically astute readers will immediately recognize the conceptual and logical hazards and complications this implies. Managing exchange rates of currencies is something which is extremely difficult, and terribly expensive to do over any period of time. The lack of theoretical limits to how weak or strong various interests wish for a virtual currency to become only further complicates an interventionist strategy.

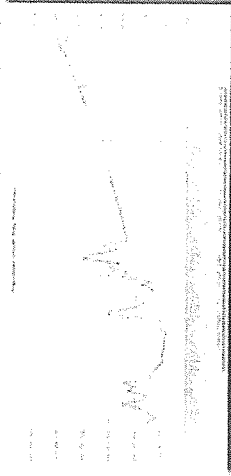


So, Linden Research is selling L\$ which they print themselves. Players buy the L\$ with real money, but they don't really own the L\$ they bought. And, Linden Research uses the Linden pseudo-Forex exchange market in order to stabilize the redemption rate of these virtual L\$ tokens. So, will Linden be so willing to buy back L\$ when demand falters?

Growth, Growth, Growth

Linden has boasted unbelievable growth numbers, even proudly displaying them on their Second Life home page. In fact, Clay

Shirky didn't believe the numbers, and challenged them in myriad forums (earning him fierce sometimes slanderous attacks from the Second Life faithful). Eventually, Linden acquiesced ("Overcounts", Shirky) and provided more thoughtful statistics which showed that Second Life, while indeed growing rapidly as measured by first-time-visitors (account creations), in fact has only about 200,000 active users (those investing more than a



week of time into the game).

From my perspective, these overcounts and growth exaggerations further aggravate my initial HYIP claims. Simply, Linden Research cannot count on perpetual growth, given their own reported statistics, to support the L\$ / \$USD redemption rate. They will have to start buying back a lot of L\$ in the near future. Or, more likely, the L\$ will just devalue rapidly, leaving everyone with money left in the game S.O.L.

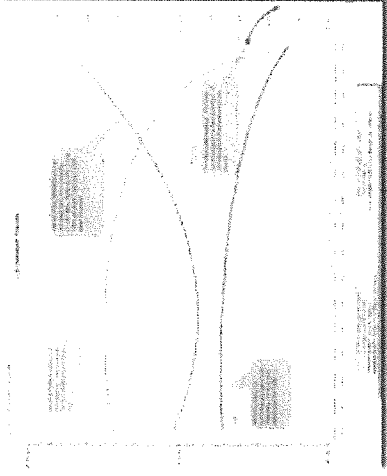
Not Just Words

I love narratives as much as any other blogger. But, the proof is in the numbers. I've taken the liberty to put Linden Research's own data through my analysis grinder, and I offer my results.

I created all these analyses from Linden Research provided data, using Microsoft Excel, Crystal Ball, SAS and my hp 49 g+.

Click the graphs to see the full size versions.

Conclusion: The L\$ to \$USD redemption rate depends upon unrealistic growth assumptions.



The growth (charted in the previous section) depends upon the assumption of an exponential growth curve (yielding a coefficient of determination of 0.70). Inspecting the actual forecast values clearly demonstrates the flaw in this assumption.

The screenshot shows a log of player actions in a virtual world. It includes entries for player logins, logouts, and transactions. Key entries include:

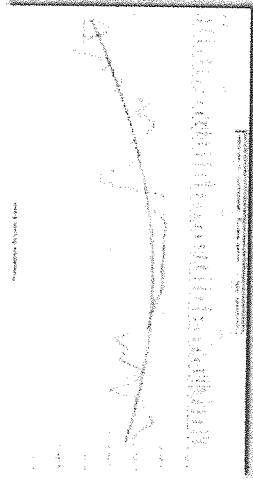
- Player logins: "Player [Name] logged in" (e.g., "Player [Name] logged in at 10:00:00").
- Player logouts: "Player [Name] logged out" (e.g., "Player [Name] logged out at 10:05:00").
- Transactions: "Player [Name] bought [Item] for [Amount] LS" (e.g., "Player [Name] bought [Item] for 1000 LS").
- Player deaths: "Player [Name] died" (e.g., "Player [Name] died at 10:10:00").

Supporting the current regime in which Linden Research is always a net seller of LS in order to support (i.e. weaken) the LS compared to the USD, Second Life must register around 45 million unique players by the end of 2008; a growth rate of 40% per month by that point. (Using an exponential growth formula, with conservative initial conditions. This matches historical growth with R-Squared = 0.70).

Note, this is a *ceteris paribus* analysis. Linden Research could, and most certainly would attempt to use "virtual fiscal levers" with its series of controlled sources and sinks to strengthen the LS in the face of diminishing growth. I maintain, however, that these efforts will probably succeed only for very short durations and, like taxation in real world economies, ultimately produce far worse unintended negative outcomes. For example, attempting to support LS strength by forcing in-game deflation would almost certainly result in a serious "virtual recession" by depressing the game's "virtual commerce".

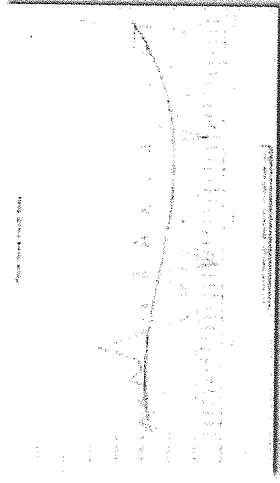
Growth is too volatile to count on going forward.

Absolute player growth, as measured by unique players and by registrations, produce equally volatile growth curves.



At best, real growth trends experienced within Second Life are sporadic and barely predictable. In this example, a 2nd order polynomial fit function still only produces 50% predictability. Such growth is consistent with the type of media-induced hype that has caused a recent influx of new Second Life users, but which may be a short lived effect.

Growth of hours per player (unique) is even more volatile, and does not yield reliable regression predictions.



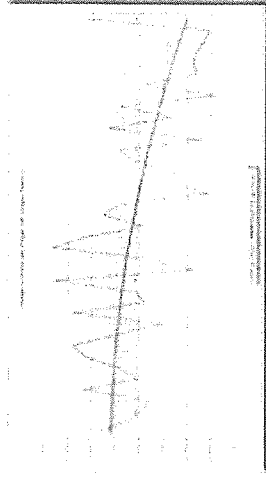
Summary statistics from Linden Research provided data for Unique Players, Registrations and User Hours, for reference:

Unique Players	
Mean	143213.363636
Standard Error	49493.214808
Median	10183
Mode	#N/A
Standard Deviation	367051.504760
Sample Variance	1.34727E+11
Kurtosis	13.849569751
Skewness	3.619028825
Range	1974603
Minimum	4
Maximum	1974607
Sum	7676735
Count	55
Confidence Level(95.0%)	99227.509621

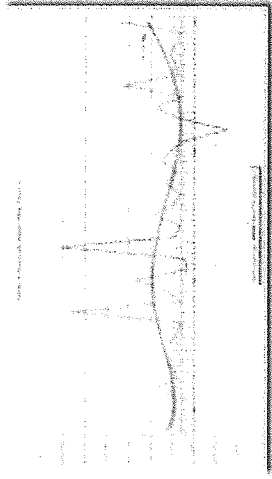
Registrations	
Mean	217526.8645
Standard Error	78057.46963
Median	14038
Mode	#N/A
Standard Deviation	576885.6882
Sample Variance	3.35113E+11
Kurtosis	14.18072371
Skewness	3.675539497
Range	3117273
Minimum	8
Maximum	3117287
Sum	11963977
Count	55
Confidence Level(95.0%)	196455.8031

User Hours	
Mean	1930528.193
Standard Error	377365.5333
Median	986550.86
Mode	#N/A
Standard Deviation	2416446.465
Sample Variance	5.83921E+12
Kurtosis	3.879096526
Skewness	1.923808589
Range	10765969.17
Minimum	5.1638.8
Maximum	10817667.97
Sum	79151655.9
Count	41
Confidence Level(95.0%)	762724.6063

Hours per total unique player is weakening even while hours per new player is beholden to spikes in media hype.



Take note of the consistent decline in hours per total unique player, barely breaking even from mid 2005 until only last month (January 2007) in an amazing reversal. Historical trends predict future months will return to hours per unique player declines.



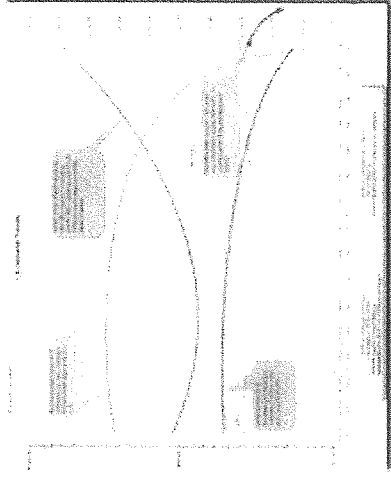
Hours as measured by allocation only to incremental new players produces more stable results. Media cycles are more readily visible in this view also, as are periods of system downtime. Summary statistics, for reference:

Σ Hrs / Σ Players	
Mean	32.76173654
Standard Error	2.345686735
Median	41.73054542
Mode	#N/A
Standard Deviation	14.83542552
Sample Variance	220.0686504
Kurtosis	-1.126882757
Skewness	-0.662596333
Range	43.36785734
Minimum	5.156864685
Maximum	48.54472203
Sum	1310.469222
Count	40
Confidence Level(95.0%)	4.744598217

Δ Hrs / Δ Players	
Mean	28.33177458
Standard Error	4.64651355
Median	21.74179192
Mode	#N/A
Standard Deviation	29.4000202
Sample Variance	864.3511679
Kurtosis	0.532052426
Skewness	0.549371165
Range	144.8994243
Minimum	-42.88256236
Maximum	102.016862
Sum	1133.270983
Count	40
Confidence Level(95.0%)	9.402582529

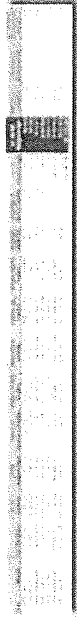
Most troubling, L\$ Spend per Unique Player is weakening.

This again returns to the conclusion:



This chart shows the rapidly declining L\$ purchased per new player as total unique players has grown exponentially. L\$ purchased per all unique players has also declined, although less rapidly, implying that most economic activity is supported by existing players, with growth in total L\$ spending coming purely from new players trying the game, then abandoning it shortly thereafter.

One other bit to consider in the context of the above graph is the trend towards seigniorage.



Unlike economies in the real world, the Second Life economy is strictly zero-sum. Therefore, every real \$1 USD extracted from the game comes from someone who put a \$1 USD in, whether directly from new users buying L\$, or indirectly through internal "sinks", which amount to little more than the redistribution of players' future SUSD redemption potentials.

High Yield Investment Programs

After reading and viewing the data and charts in this article, make up your own mind about similarities between the Second Life L\$ based economy and a HYIP game. The following are attributes of HYIP schemes and games.

- It is theoretically possible for a HYIP to be legitimate, and not a pyramid Ponzi scheme. To date, however, all HYIPs have turned out to be Ponzi schemes.

- HYIPs are normally offered over the internet.
- Entry costs (initial deposits) are very low, often less than \$10USD.
- HYIPs usually utilize e-currencies or virtual currencies, making it possible to accept very small investments and easily cross jurisdictions and other boundaries.
- HYIP virtual currencies usually introduce psychological "breakage" by being denominated in sub-penny units, making inbound investments, internal activity and unrealized gains feel larger to participants.
- HYIP participants strongly encourage and self-enforce thinking of internal activity only in virtual units, not in \$USD translated value.
- HYIPs disclose little about internal strategy, management, or operations. They often publish financial data, sometimes large amounts of detailed financial data, but they almost always refuse to do so in a meaningful, methodological manner which can be verified.
- HYIPs usually present emotional appeals, appeals to faith, promises of financial freedom, or promises of a new economic reality with active members best positioned to benefit financially.
- HYIPs often claim returns of greater than 1% *per day* [that is an order of magnitude per year. Some Second Life banks offer 1% per day interest, incidentally; Many Second Life "businesses" boast 50% per month revenue growth].
- Three types of people typically enter HYIPs:
 1. Naive, unwary, and ignorant. These are most HYIP recruits. They are usually recruited or referred. They are attracted to the HYIP as a source of income, often one which they are desperate to have. Once the HYIP fails, this group is often considered to be undeserving victims.
 2. Gamblers. A smaller group are those who know the HYIP is inherently unstable. Some even see it as a Ponzi scam from the start. But, they calculate that they are early enough or can outsmart the game and earn returns nonetheless.
 3. Cheerleaders and shills. Some in this group are the organizers or first entrants. Others are those who've realized small profits from the game, and seek to grow the game in order to push themselves up in the pyramid structure,

thereby amplifying their returns.

- Most HYIPs are positioned as low or no risk opportunities, being that little money is needed to start, and time invested is not considered a cost.
- HYIPs are zero-sum games by definition. All realizable returns come from real money investments.
- Forum, blog, and email list users will gain trusted reputations, ensuring others they have indeed been able to withdraw real profits. They will quickly surround, counter and drown out any criticisms to the contrary.
- These games are not defensible as lotteries (although some have used this legal defense) because the odds of winning returns cannot be calculated ex ante.
- Public forms which endeavor to monitor HYIP games and warn unwary investors are nearly always overrun by cheerleaders and shills.
- The mainstream media often mistake HYIPs as legitimate, lacking understanding of internet communications (and thereby ascribing credibility to testimonials by cheerleaders and shills).

It is often argued that the Second Life virtual economy does not qualify as a HYIP type of structure because the nature of internal commercial activity largely involves productive endeavors. By productive endeavors they are generally referring to virtual item design and creation. At a detailed level, these are largely graphics design, 3-D computer modeling, computer art, and script programming activities.

I maintain this is false. While lower-level players may earn some returns, by and large their investments into the game (both capital and labor) are trapped and not monetizable at fair market redemption rates. Two detailed responses to the productive endeavors objection:

1. It is unclear how much of a percentage of the virtual economy is driven by these "productive endeavors" versus the online gambling, sex and real-estate markets. The first two are clearly not productive endeavors and likely constitute a significant portion of the internal L\$ economy. The latter is by definition not creating financial value because players have no financial claim on their virtual property -- they have no effective virtual property rights under current US and California laws. Further, there exist no supply or production function restrictions which would enable long-term price stability of virtual real estate. Over

- time virtual real estate will be worth only its marginal cost to provide as a product (disk space, electricity, router depreciation, etc.).
2. Productive activities produce real returns for players only insofar as they are able to redeem L\$ cash flows for real money -- players have no financial claims on anything which resides on Linden Research's servers or network, including Linden dollars (only on limited forms of conceptual intellectual property). The continual weakening of the L\$ by Linden Research is a mechanism by which potentially realizable financial gains instead accrue to the game's organizers, and to others with a similar ability to run their own L\$ - \$USD redemption exchanges. Therefore, these players, even while feeling they are engaging in productive endeavors with positive financial returns, more serve to enrich those at the top of the game while also acting as testimonials to attract new game entrants.

Cult Second Life

I learned a valuable lesson my first go around with the Second Life faithful. Second Life is not a game to many involved. It's more of a cult. I attempted to honestly engage all of my critics. Unfortunately, I learned that such is a wasted effort when dealing with the blind faith that afflicts Second Life True Believers. In the end, it's not all that much different from trying to talk rationally with someone about Amway, Herbalife or [Robert Kiyosaki](#).

OK, one thing really annoyed me. A few supposedly prominent Second Life blog authors dismissed my first article because I was anonymous. In fact, I was not and never have been. But they, like pretty much everyone else in the Second Life universe, were. [Shouted Elaine Benes style through a hand megaphone] "You're Anonymous!"

And a Disappointment...

I was particularly disappointed by some in the academic community, as a response to my original article. I understand and appreciate the intense interest among academics in Second Life. Indeed, many are interested in aspects of sociological, communications, pedagogical, and cultural phenomena related to the Second Life Virtual World. I cannot speak to these topics with any knowledge or authority. However, I am baffled by the response from some "virtual worlds economics" authorities. One response in particular dismissed my first article as "so

obviously wrong it was hardly worth discussing". Further, it went on to claim that harsh criticisms such as mine threatened to destroy the very future of Virtual Worlds. And, finally, we were told that Second Life is really a lot like fictional "Mayberry", and not the brutal world of markets and numbers I suggested.

That response stretches the credibility of its author. If one guy can knock over Second Life or the future of Virtual Worlds in general, then they are hardly deserving of our attention. And, Second Life is "so obviously not Mayberry", on so many levels, that "it's hardly worth discussing". I cannot help but wonder what vested interest one has in Second Life in order to resort to wholesomely painting it as the black & white home of Any Griffith. Just a few obvious shots (the Second Life echo machine's endless repeating of the Mayberry analogy set these up for me, even if they are easy targets):

- Mayberry never printed their own money. No one spent Barney Bucks at Walker's Drug Store.
- If Mayberry started printing Barney Bucks, Andy would have arrested them for counterfeiting.
- There weren't all too many prostitutes and call girls hanging out at the Mayberry Hotel.
- Myer's Lake was not a big casino where people sat around playing rigged Tringo games and got paid to sit in chairs pulling rigged slot machines.
- Explicit interspecies sexual role playing wasn't seen as mainstream behavior, not to mention ageplay.
- Tax evasion, money laundering, gambling, sex trade? No, all Mayberry had was a tad bit of moonshining from time to time.
- Eventually Wal-mart would have put Weaver's Department Store out of business, despite the protestations of any authoritarian artisan community or overtly anti-capitalist Bourgeoisie.

Corrections and Press Policies

I will make corrections, as discovered by myself or readers, to the original article by annotating such within the original work. These notations will consist of bracketed annotations "[]" and strikeouts "~~strikethroughs~~", as appropriate.

Unfortunately I cannot accept requests from "mainstream media" for interviews or commentary. I will respond to emails which request clarification or explanation about something I have written, although I much prefer use of the open comments

section on the blog site. Mainstream media is defined as newspaper, magazine, radio and television.

Disclaimers

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Technorati Tags: [HYIP](#), [Linden dollar](#), [Micropayments](#), [Second Life](#), [Virtual Currency](#), [Virtual Economy](#)

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COMMENTS

I was entranced by this article, randolf. Thanks for all this information. You've confirmed, with numbers, what I've felt to be true for some time.

One rebuttal that I foresee from the cult crowd is that the drop in value per unique user can be attributed to more registrations, especially more registrations of alt accounts (unlikely to have value attached to them) or of people who simply registered and grew frustrated and never came back.

But if those points are asserted to your argument's detriment, it also presupposes the still largely unacknowledged (among the MSM) truth: Second Life is not, after all, serious business.

Posted by: [Peitey](#) | [Wednesday, February 21, 2007 at 08:25](#)

I'm no economist, but I think this is a great article. I'll confess that when I heard someone describe making money in Second Life I had this sudden vision of a giant craft fair enclosed in a bubble with tool booths at all the exits. While many people make money selling crafts, it doesn't strike me as a solid foundation for a real economy.

Posted by: [Rod](#) | [Wednesday, February 21, 2007 at 09:05](#)

One rebuttal that I foresee from the cult crowd is that the drop in value per unique user can be attributed to more registrations, especially more registrations of alt accounts (unlikely to have value attached to them) or of people who simply registered and grew frustrated and never came back.

That is a very good point. It would be interesting, then to see how the numbers scale with "daily unique logins". That number is not directly published by Linden Lab, but can be reliably derived from the 7, 14, 30, 60-day unique login data they do publish.

By plotting the published uniques and fitting a curve to the data (a power-law fits the data with R^2 greater than 0.99), one can extrapolate to $t=1d$ to get a very good estimate of the one-day unique logins.

Digging a little deeper, we can also get a good estimate of

the growth rate of daily unique logins (the average rate of increase over the time horizon T goes roughly as $\exp\{0.017 T\}$), and find that the average time for daily unique logins to double is around 130 days. This indicates that simply compounding the 1-month growth rate along the curve will cause one to dramatically overestimate the true population as a function of time.

Randolph, I've got this information tabulated as far back as the beginning of October. I'd be happy to tidy it up and pass it along if you'd like to add another dimension to your analysis. Feel free to drop me a line if you'd like to discuss.

Posted by: [Tom](#) | [Wednesday, February 21, 2007 at 09:35](#)

The fact is that there are less real dollars being spent on L\$ per user, whether measured as all unique users, registrations or incremental new users.

There could be any number of reasons for this. It also is not unexpected; it's part of a typical adoption curve. As more mainstream customers come on board, they often contribute less margin per head.

But the L\$ masquerading as a convertible currency complicates things.

Ignoring *why* there is less \$ spent per player as # players grows, there has to be an ever accelerating number of new players or there will be a decrease in demand for L\$, and thus an ever weakening L\$.

Or, Linden will benevolently start buying back L\$ from players [running virtual businesses] in the game looking to cash out L\$.

Or, the SL L\$ economy will shrink -- virtual recession/depression.

Two of those three outcomes mean that those with L\$ based "wealth" will get screwed. As with HYIPs, timing is everything.

Posted by: [randolfe](#) | [Wednesday, February 21, 2007 at 09:42](#)

I would be interested in discussing these issues with you. I strongly disagree with your arguments and thought we had made some progress towards a compromise position over at

Terra Nova, but I see you've returned to your extreme views. If you're interested in a serious discussion, could you give some assurance that you are not merely trying to create a "buzz" and traffic to your web site? I'm not really sure where your motivations lay. On the face of it, it almost seems like you're setting up straw men just to knock them down. I'm not sure what you think you have contributed that is new and I'm not sure how much you have bothered to read what others have said before you.

Posted by: [IamEric](#) | [Wednesday, February 21, 2007 at 10:16](#)

Interesting article. I'm not 100% sold on it because it assumes the key base metric is total user numbers. I get the (unsubstantiated) feeling that the more important metric is active users in-world - how do your stats look if you use that as the base assumption? I'd love to know.

Posted by: [Alan Fleming](#) | [Wednesday, February 21, 2007 at 10:27](#)

Eric,

I have read everything, including a lot of barely comprehensible hate mail, and considered all viewpoints to the best of my ability. That is, by the way, in stark contrast to the our last discussion's host over at TN. Apparently he doesn't need to bother with evidence questioning that which he already knows to be true.

My compromises have been acknowledged in this article. I never intended to acquiesce on my contention that "virtual currencies" in the mold of the LS are unnecessary, ill-advised, and perhaps intentionally self serving.

Tell me, please. Why exactly does Second Life need it's own currency? Why not just let people spend and keep real money without being forced to surrender it to the game's good will?

Posted by: [randolfe](#) | [Wednesday, February 21, 2007 at 10:43](#)

Alan,

That is a good point, and in light of Tom's earlier comment, I think we can explore this line of analysis. If Tom's model

can accurately interpolate the unique daily logins, and we can make some assumptions about hours per login session, maybe we can make some informed statements about concurrency trends.

That would also enable us to further confirm or disconfirm whether increasing L\$ demand is churn-based instead of value-based.

Posted by: [randolfe](#) | [Wednesday, February 21, 2007 at 10:50](#)

On Motives:

Just to diffuse the typical allegations, I just checked the ad-revenue meter.

Your current earnings balance: \$2.14

Seriously, if anyone can tell me if/what I've gotten wrong about context ads I'd be grateful. I'd just like to break even on bandwidth costs.

Posted by: [randolfe](#) | [Wednesday, February 21, 2007 at 10:59](#)

Randolph, I've been experimenting with Google AdSense as well and I've written a bit that you might be interested in. The basis synopsis is thus: you need to be a largish site to actually make money off advertising. If you're a smaller site, you just aren't going to get the site-targeted ads, and so you only make money when someone clicks on an ad, which for a small site is very rare. My AdSense earnings are just under \$7.00 :-/

Posted by: [Cyde Wexs](#) | [Wednesday, February 21, 2007 at 11:06](#)

Interesting analysis, I'm going to have to agree with Alan though, a position posited on exponential growth curves invalidates your conclusions in some respects as an illogical economic outcome.

You'll have to go after a harder target and that target is daily concurrent users, \$ spent, time spent in game.

You should then be able to extrapolate a mean $S/\text{user}/\text{time}$ ratio and predictively model what stabilization methodology

would be required to maintain L\$/USD stability over time based on:

1. Registered users
2. Conversion rates (number who adopt SL and participate)
3. Extrapolate "what type" of user they need to adopt, i.e. They need someone to convert to a paid subscription basis and spend X amount of time X and engage in X amount of economic activity to achieve price stability, without dilution (printing their own currency).

Also there are two areas that would provide more relevance:

1. LL controls prices through supply/demand mechanisms on a macro scale via land creation
2. All VW currencies devalue as the population declines (demand). I brief study of MMOG's and RMT should illuminate this point. This is why gold farmers move from game to game, and allocate resources based on where the highest returns are (highest demand curve).

Note supply is never an issue here because supply is unlimited or rather inelastic, whereas demand is premised on popularity.

In summary as long as SL maintains a stable and incrementally growing number of concurrent users, who maintain a reasonable level of economic activity and LL continues to maintain a high value/scaricity for land prices. They should maintain price stability.

All this is premised on maintaining SL popularity. And not unlike any other MMOG, which engages in marketing to obtain the largest number of users possible.

Therefore SL is merely engaging in legalized RMT.

Anyhow good run down, as an objective observer (I see value in SL as a VW, and an economic experiment, albeit one with many caveats) I think your getting as close as your going to get with public data.

However there is one thing I think you and Shirky need to realize, its highly unusual for any game company to release numbers, hard numbers or otherwise. I think LL should be commended for that, even when you disagree on their business practices you should at least acknowledge their

taking this step and going where no other game company would dare step foot.

In this, it serves as a good experiment as well, does transparency lead to positive or negative outcomes?

Thats the take away on a larger scale that every other game company watching this debate is going to learn. In essence this effects VW/MMOG's going forward.

Posted by: [Allen Sigat](#) | [Wednesday, February 21, 2007 at 11:55](#)

"Honestly engaging" in general does not tend to mean "dismissing all of their points out of hand and continuing to characterise the entirety of SL as an investment opportunity for people who don't want to do anything, and a bad one at that". I have no interest in getting into this again.

Suffice to say that if you can dissuade people from entering SL to make money, you are very much serving my interests. Please, anyone reading this: do not enter SL to make money. Stay away. It is a _rubbish_ way to make money. Assume that, once you join, every dollar you invest will achieve zero financial return, and you will have the right attitude.

Posted by: [Ordinal Malaprop](#) | [Wednesday, February 21, 2007 at 14:44](#)

Allen,

Your points are well taken. I whole heartedly agree that concurrent usage, probably as measured by hours per unique login per period, is the ultimate key to long-term price stability.

It sounds as if we can build a reasonable model based on the data Linden has provided to that end.

But, you hit on a key point I have found through my writing on this subject is missed by many of the Second Life cheering squad: it is a game and its price stability as related to the value of the L\$ is dictated by the popularity of the game. In my first article I probably received over 20 emails complaining that I even dared to call Second Life a game.

The previous poster is a case example. I do not dismiss any of the non-game things people cherish Second Life for. I simply stated that I cannot speak to these subjects with any credibility, so I don't. I am only talking about the Second Life "economy", not all the other stuff. Borrowing the vocabulary of a Terra Nova professor, Second Life's other attributes could be the Bees Knees, but all I care about in this critique is the L\$ Economy. And, it is the L\$ Economy that the media keeps echoing over and over (see Forbes online today, for example).

I do commend Linden for releasing numbers; were I advising their management, I would recommend releasing practically nothing. But then again, were I advising them I'd have them using real-money and a batch-payment processing micropayment system and not playing pretend nation builders.

Posted by: [randolfe](#) | [Wednesday, February 21, 2007](#) at [15:42](#)

Fairly new to the whole Second Life argument, but I see the Linden as being a very unstable currency. consider this: the official exchange rate of Zimbabwean Dollars per US dollar is 250:1. Yet this rate is unrealistic, and caused an absolute lack of credibility in the currency and government behind it, something bound to happen to Linden Labs.

I would also be interested in your thoughts on whether people from Iran and North Korea playing in Second Life is a violation of US embargoes against those countries.

Posted by: [Economic.Mip](#) | [Wednesday, February 21, 2007](#) at [17:15](#)

I suspect that the L\$ may be more stable than you expect, or at least that it is capable of surviving to have a 'soft landing'.

It is very likely that, in printing L\$ to stabilize the exchange rate, Linden Labs is making a tidy profit, or seniorage. The questions to be asked are:

1. Is it likely that there would be a 'run on the bank', as large numbers of people try to get out of L\$ in a short period of time?
2. If there was a run, would Linden pay to maintain the

value of the L\$, or devalue it substantially (to, say 2000), or would they devalue it a little and try to hold things together?

3. Absent a run, is there any reason to doubt that Linden Labs has the ability and self-interest to maintain a semi-stable L\$ versus the US\$?

I think that the answers are:

1. Depends on mob psychology.
2. Maybe. Depends on the psychology of Linden's investors.
3. I think that they can hold it together.

After all, from the point of view of Linden Labs, this is kind of like a gigantic versions of 'Sim City'.

Posted by: [Dave](#) | [Wednesday, February 21, 2007 at 18:03](#)

I liked your first article and the information you provided. I did not agree with it, but it was great article and interesting reading. I don't doubt that its gone for good.

There is such a thing as too many numbers and you are displaying them above. (lex parsimoniae) Keep it simple, HYIPs are frauds they say one thing and deliver something 100% completely different. That is not the Linden dollar or SL. You can apply all the math theory and projections you wish but it won't change the concept...get back to basics, HYIP=FRAUD/SCAM/BIG LIE, no matter how many people think they are playing or investing-> its a fraud. The Linden Dollar is a virtual game currency, now you may want to quantify that label with lots of explanations and wiki links, but whole concept of online currency is new to the world these past years and none of those will labels stick, at least not for a few more years.

If there were 100 or 200 'agents' exchanging the L\$ and USD the 'exchange rate' would be more level and the market more liquid. Its not fair to compare the L\$ to any HYIP/Fraud or Ponzi, that is not accurate. Its more like an OTC stock in that there is no super large liquid market of buyers and sellers so the more you sell the faster the price or rate falls. Simple market reality. Give it time.

Mark

<http://www.digitalmoneyworld.com>

Posted by: [Mark Herpel](#) | [Wednesday, February 21, 2007 at 19:16](#)

Mark,

HYIPs are not frauds by definition. It is only ex post that they are Ponzi schemes. While one is in operation, it is not necessarily illegal or fraud. That's the whole problem/debate around HYIPs.

The problems with the L\$ are not simply liquidity, and I strongly suspect you also know that. There is no shortage of people like me who attempted to deliver such liquidity, only to find out that "currency management" only cuts one direction.

I have a simple question for you. How can there be liquidity without arbitrage, the very thing that literally hundreds of Second Lifers emailed or commented to me was the whole reason I didn't "get it". Even one guy above said something about the problem being "people who think they can make money by doing nothing". Apparently liquidity is not a goal of either LL or SL players.

Incidentally, liquidity is seldom honestly pursued by organizers and leaders of HYIPs either.

And one final question. I have yet to hear any compelling reason why Second Life or any other similar platform needs its own independent currency. I'm really waiting to learn that I've missed some huge fundamental reason that batch payment processing or non-redeemable payment credits are not sufficient, even though they work fine for platforms thousands of times larger and more active. Why does having an avatar mean I need to have cartoon money too?

Posted by: [randolfe](#) | [Wednesday, February 21, 2007 at 19:50](#)

"Why does having an avatar mean I need to have cartoon money too?"

Because, randolf, as long as you have the illusion that it's all Monopoly money you don't feel quite so ashamed at spending real money on your little virtual world.

Posted by: [Petey Awful](#) | [Thursday, February 22, 2007 at 00:20](#)

Most importantly I'd like to say keep going! Your posts are interesting and I for one enjoy reading carefully considered ideas from people with opposing views. The world is nothing without free and open debate.

I'm not an economist unfortunately so can't get to the bottom of all that I've read here. However I will say this, SL is many things to many people. If there are those that wish to seek out profit I wish them nothing other than the best of luck. However for many the SL is indeed simply a micropayment, something we use to fuel our 'entertainment'.

I spend most of my time in-world designing, building and scripting objects for use in the education side of SL, a side in which I believe SL has great potential. As with much of the education community I endeavour to share objects freely, another valuable side to the world (although not the economy).

For me whether you love or loathe SL (including the 'economy') it is simply the notion of such a world and its inherent potential that is worth celebrating. SL won't be here forever, but nevermind, what surpasses it should be much better :-)

Posted by: [Dan](#) | [Thursday, February 22, 2007 at 06:12](#)

Dan,

I hope I've made it clear that I don't take any issue with all those other great aspects of Second Life. There are many good things going on there, just as there are some not so great things -- just like in the real world.

My singular issue is how the media has become a hype-tool for the SL "economy". The real story is Web 3.0 or distance education or the evolution of how we all communicate. But all the promoters fan into the media machine is "virtual gold mine" crap.

And the SL economy, as it is structured, is a perversion. It doesn't have to be that way, and I don't know if it's intentionally that way or just accidentally that way, but that's the way it is. And the SL economy status quo cheerleaders are cynical, self-serving, or worse.

Those who "really" care about the SL platform, potential,

and promise shouldn't be rallying around defending this regime. They should be demanding its immediate reform.

Posted by: [randolfe](#) | [Thursday, February 22, 2007 at 08:48](#)

I earnestly repeat my question. This is not rhetorical.

Cynical reasons aside, what legitimate reason compels Linden Labs to need an independent, convertible currency?

Are any e-currencies or virtual-currencies ultimately legitimate? Can someone provide an example that doesn't involve conspiracy theories, supernatural one-world fantasies, or just a desire to have money that isn't easily tied back to the gambler/lauderer/etc. ?

Posted by: [randolfe](#) | [Thursday, February 22, 2007 at 08:53](#)

Those are some bad R^2 values. Anything under about 0.8ish should be thrown out, and you have some as low as 0.5. Maybe you should use some different trend line functions?

Posted by: [Interfect Sonic](#) | [Thursday, February 22, 2007 at 09:48](#)

Nazi Linden Labs and SL players must accept criticism and allow players to evaluate the truth behind their claims through in-virtual-world experimentation and surveys. Legal action must be needed here.

Posted by: [Unacceptable](#) | [Thursday, February 22, 2007 at 10:04](#)

Interfect,

The RSQ numbers are terrible in some of the graphs. This was intentional to show the data is volatile and not likely to yield reliable extrapolations.

On one of the Second Life "official" blogs an author questioned why I halted at 2nd order curve fitting; he suggested I should have used 10th order functions.

I'm sure more statistically inclined folks see the flaw in simply finding the function that connects the dots. I'm not

sure I'm even comfortable defending a 2nd order model if really taken to task.

And, I didn't really go all out and build a full fledged hypothesis testing model. My analysis here is strictly simple regression, mostly because I lacked the time (and interest) to try to fully test a number of multiple regression models and work out all the multicollinearity.

Posted by: [randolife](#) | [Thursday, February 22, 2007](#) at [10:10](#)

Your article is as irrelevant as it is amusing. Such concern for silly monopoly money from someone so uninformed about Second Life that he calls it a "game"...

The Linden-dollar is irrelevant. I've never bought or sold a single L\$.

I do my business in real money, for I wholeheartedly believe that the promise of Second Life is not about the fake money, but rather about its technology.

I do not care how many people there are in SL. I don't really know many of them. I don't bother with silly marketing projects. My clients want to use SL as part of their workflow, integrated with their core business, to get an ROI.

All of those silly content companies popping in and out of existence will be dead within a year if they don't realize that there's more to the internet than advertising.

I would still make just as much money if I had a single copy of the SL client and server, even if nobody else used it in the entire world, and there was no builtin money feature. SL is a content development tool. It will continue becoming more and more of one, and less of a community or world.

Posted by: [wotevat](#) | [Thursday, February 22, 2007](#) at [10:42](#)

Randolph;

Help me out here, because I am pretty sure that I am missing the argument. (But actually accept the conclusion: why should there be a cartoon currency instead of micropayments for entertainment?)

Suppose we have a monopoly game with 7 players, everyone pays a \$20 entrance fee, the bank is fixed and the

winner of the game gets everyone's money, less say 10% for the house.

Nothing wrong with that. It is a zero sum game, with funny money, but a fixed real/funny payout, 0 for most and \$126 to the winner.

Now suppose that we let people cash out in the middle of the game, and give them their expected value based on their position, less some cash out fee. Still nothing wrong.

Next let the bank print more money inside the game to facilitate trades and building during the game. Again, we are changing nothing to the basic structure of the game or payout. My monopoly money, if I am winner, is formally devalued, but nothing about the basic bet has changed.

Next, the bank not only prints more money but adds new people to the game, perhaps as limited partnerships with the existing players. The bank receives new real money, prints more cartoon money and receives its house share.

Again, I don't see a problem with this more novel monopoly set-up. Fraud has not been imported by any of these rule changes.

As far as I can see, the Second Life game is sufficiently like the novel monopoly set-up.

Where have I gone wrong in my reasoning?

Posted by: [Michael Webster](#) | Thursday, February 22, 2007 at 11:34

It's interesting how you've laid it out, and you're right that there are various paid LL evangelists and unpaid cultic shills all over the SLogosphere, but there's also the "backlashistas" who become cultic and obsessed about backlashing on SL, even when presented with legitimate growth numbers -- like the 57,000 premium accounts which is a number that has boomed (since June 2005 when it was 5,000), or the numbers of people who have spent at least \$1 inworld, i.e. in January, 187,000, which is your real, publicly available number, if you find the 3.5 million to be absurd (we all do).

I particularly enjoyed your remarks about Mayberry. No, Mayberry didn't have prostitutes or ageplay or gambling and

it also didn't have things like rental agents who fraudulently sell land on islands, evict the tenants, and re-sell the land again, with impunity.

And no, Mayberry's banks didn't print money like Yeltsin printed the ruble in Russia, leading to the krakh or ruble crash in 2002-2003.

But Second Life is still a lot more like Mayberry than you seem to want to give it credit for, with thousands of people interacting, buying, selling, socializing, learning, etc. as they would in Mayberry.

It is important to remember this is a synthetic economy. It is something that is more than just some internet gold-selling hype page, and much more than just a mail scam. It's a world.

The Lindens put up the notion of the "licensed game token" instead of fiat currency precisely to avoid not only claims by governments for taxes or 1099 forms for employees or whatever, but to avoid a demand that they have to buy back that currency on demand.

They don't. There is nothing in the TOS that can be construed that says LL has to buy back any of the Monopoly money in your account.

The interesting thing is that even before there was a LindEx, anonymous avatars kept their own thriving forex going at Gaming Open Market, now defunct (and GOM'd, as the saying now in the vernacular has it -- co-opted by LL). And at its peak, before LL announced its competition, it had rates of \$4.25/1000 without any of the manipulation you see now on the Lindex (indeed that's how the price could rise -- people valued it).

As for the absolute numbers of hours going down, Raph Koster has written about this: when you start a game/world, the early adapters spend long hours leveling up or mastering the tools and in the case of SL, are the ones who created a lot of the content, scripted items etc through long hours.

The generations of people who come later are more casual. So they might log on for only 2-4 hours to socialize and dance, not 10 hours to animate the dance poses that make a chorus line.

(I'm still hunting for the articles where he says this but it's

definitely on his site at www.raphkoster.com)

Raph Koster is no Kool-Aide drinker of the SL brand. His response to this article reminds us of "value". The "labour theory of value," in fact.

People labour, level up, make stuff, and others value their labour and product and pay them for it. It's an economy. It may be a crude and synthetic economy, but it's meant and understood as and participated in as an economy and a world, not an "investment scheme".

Randlfe, your writings remind me of Russia again. People in Russia do stuff like dig in the cold dirt and produce some wilting cucumbers they sell at the metro for 5 cents and survive -- long labour, little pay. Or they are relatives of the party boss who used to control the carbide factory and they somehow get their hands on the plant and its products and they become oligarchs and make a fortune. Or they are propped up by the high price of oil now. Or whatever. There's huge volatility, there's huge scheming and corruption and syntheticism everywhere.

That doesn't mean the old babushka digging the cucumber and selling it and the person buying it are taking part in a scam run by ex-KGB agents. Nor does it mean that, say, Harvard gurus who unwisely engage in inside dealing and get involved in loans-for-shares as an "investment" (for which they're found liable later) are somehow the norm. They are just one racket that appeared among many around the phenomenon called "The USSR has the largest firesale in history".

People coming on this economic "miracle" might make a bundle or might lose their shirts, depending on things like their proximity to the mayor's brother-in-law and their ability to buy/bribe for the right license.

But none of that takes away from the reality of the lady who can now sell her cucumber, wilting that it may be. It doesn't take away from the hundreds of women now with international modeling careers, even if their lesser sisters are victims of sex-trafficking. It doesn't take away from the thousands of legitimate Russian businesses that manage to get started in the Wild East environment, whether book publishers or processors of fruit pate.

My point is that Second Life is that kind of complex organic thing, even though it has the rigged and synthetic and

corrupt and misleading factors of a Russia in the 1990s, and the government in it is also printing and selling the currency.

It's a far more complicated -- and therefore optimistic -- story than you've rendered it. The servers are more likely to collapse before the economy does. But that's why the people will be able to pick up and just move to new servers put out by this company again or another.

Posted by: [Prokofy Neva](#) | [Thursday, February 22, 2007 at 11:47](#)

>SL is a content development tool. It will continue becoming more and more of one, and less of a community or world.

wotevar, whenever I see this kind of tekkie platformist talk, I have to ask, ok, the people in this world are all just load testers for your august software making experience, their economy and lives are mere beta testers for your fabulous coding career, but then...what?

So you took this content-creating-tool. You...then have to ultimately make...content. And then...who will buy it?

Or you think you'll just perfect it and sell it or hand it off to other people who will do all that messy making of worlds and communities that you scorn.

But how will they do that completely shorn of any context to the development itself? Why won't they get to have any say in, or participate in the development of the tools, as they would in a real-life government drastically affecting their lives?

It's that narrow-band perception of the tools and platform as a neutron bomb that regularly removes all the living people on the platform for the sake of the development of the security device that is one of the most nauseating aspects of the formation of the Metaverse.

I don't think you can make a content creation tool in isolation from its users in that fashion, and yes, that means you have a world.

Posted by: [Prokofy Neva](#) | [Thursday, February 22, 2007 at 11:51](#)

Michael,

I think the simplest answer to your very reasonable analogy-question is:

Your situation has a known, well understood end-game in which all "losers" get no payout. I do not think this is largely believed, understood, or communicated by the SL economy advocates.

You also assert it is a game, which I largely agree with. But that contention alone will get stuck in endless arguments with the SL community and related researchers.

An earlier commenter posited a very simple equation: These games hold value while they are popular. When they lose popularity, they lose value. If you can get the SL opinion leaders to agree with that, acknowledge it, and preach that message, I'm on board with your analogy.

Posted by: [randolfe](#) | [Thursday, February 22, 2007 at 12:13](#)

Prokofy

Again, thanks for your contributions. I hold you in particular regard for being willing to debate these topics in a reasonable manner. I must credit you with the term "authoritarian artisans", which I used in my article.

In light of my last comment to Michael, I would contend that if Second Life did not use L\$ monopoly money, but instead a conventional micropayment model with real money, then the economy's "value" would be exportable and capable of surviving an "end game" scenario. Someone else could take the bits and reassemble them on new servers, or the whole thing could open source. A lot of other dynamics would change, but people would retain their presumably realized profits, and not be forced to relying on the external economy for realization.

I like all your Russia analogies, but I think there is a fundamental difference. Russia was an independent economy, even during the default era. Second Life is a dependent sub-economy, which is incapable of producing realizable value.

Or look at it like this. The Russian from Novosibirsk sells her wilted cucumber for Russian currency. She spends that

money at the market, and gets to eat borsch that night. She has produced and realized value, without needing to resort to exchanging her many rubles for a single Yankee dollar to accomplish that.

(OK, so I know that dollars and euros comprise(d) a whole underground currency market, as happens in every hyper-inflation situation, but you get my point.)

Posted by: [randolfe](#) | [Thursday, February 22, 2007 at 12:25](#)

As the person referred to in this comment:

>On one of the Second Life "official" blogs an author questioned why I halted at 2nd order curve fitting; he suggested I should have used 10th order functions.

For the record, despite your quotes around official, Second Life Insider isn't run by Linden Lab, nor to the best of my knowledge funded or supported officially by them. You might also like to check the gender of your personal pronouns.

You went on to say:

> I'm sure more statistically inclined folks see the flaw in simply finding the function that connects the dots. I'm not sure I'm even comfortable defending a 2nd order model if really taken to task.

Actually, since we're in a forum where discussing things in full detail is encouraged the reason I suggest 10th order poly's is your R-squared values are low enough that I don't trust your extrapolations. Raising your R-squared so I did would take some higher level of polynomial, and I'm enough of a statistician to know that his its own issues. The trouble is, you go on to make a series of points that rely on your extrapolations, and you make them without caveat. The academic writer that I was trained to be objects to such loose writing.

Finally, deep down in your comments, you publish your caveat:

>The RSQ numbers are terrible in some of the graphs. This was intentional to show the data is volatile and not likely to yield reliable extrapolations.

It leaves me wondering just why you make such strong assertions about the data supporting your point of view, when, under pressure, you say that they don't yield reliable

extrapolations.

I still wonder if you're right. I just don't trust the data that you claim support your argument, and find it all too easy to dismiss the argument you present when you are using extrapolations that fit so poorly to the actual data.

Debating opinion is fine, and good. Claiming your opinion is supported by your data when that assertion is more than questionable raises questions about you having an axe to grind again I'm afraid.

Posted by: [Eloise Pasteur](#) | [Thursday, February 22, 2007 at 13:05](#)

"Actually, since we're in a forum where discussing things in full detail is encouraged the reason I suggest 10th order polys is your R-squared values are low enough that I don't trust your extrapolations. Raising your R-squared so I did would take some higher level of polynomial, and I'm enough of a statistician to know that his its own issues."

Population numbers are clearly the result of a stochastic process. Using higher-order polynomials in an attempt to get a higher R^2 is about the worst thing one can do in such a case. It's much better to try to find some reasonable mean behaviour and try to quantify the variation around the mean by calibrating the random behaviour.

In any event, R^2 isn't always a reliable measure of goodness of fit and shouldn't necessarily be the deciding factor in tuning a model.

I mean, we could always use an N-1 order polynomial fit to our N data points and get a perfect $R^2 = 1$. Would that be a good model to extrapolate from? Doubtful.

Posted by: [Tom](#) | [Thursday, February 22, 2007 at 13:27](#)

Eloise

My apologies on mistaking your gender. I inadvertently mixed you up with the guy (I think guy) from Reuters. I offer in my defense, however, I can hardly keep track of who's a guy, girl or furry when everyone has superficial names as such. I got beaten up last article for refusing to use gender pronouns (which I did to intentionally highlight commenters' anonymity).

The RSQ of the exponential growth extrapolation is .7018. Not a great RSQ, admitted. But not irrelevant either. To be honest, I kept the power law down because poking around with higher orders caused the growth to explode faster. Originally, using a 4th (or 5th, I forget now) order growth curve I found that by 2008 there would have to be over 200 billion account registrations. I decided to take a lower RSQ to be conservative. It is fair to criticize that.

That explanation also applies to the terrible RSQ value in my composite "graph" of 0.5234. When I turned up the powers I got a gloomier outlook. I took some qualitative license, but still published the numbers so people like yourself could take detailed issue, as you have.

My analysis is far from perfect. I have already gained insight from this thread's comments that are contributing to my experimenting with another contributor to create a more comprehensive statistical model, based on concurrency and logins per time series.

By the way, my qualitative conclusions about spend rates were based on the more conservative dollar per total unique users, thereby addressing the growth-of-existing users versus churn-users. That RSQ was 0.886. Not terrible.

[Addendum: my apologies also on mistaking your blog entry as "official". It was a third party in my last article's comments who referred to Second Life Insider as 'official'. I should have verified that.]

Posted by: [randolfe](#) | [Thursday, February 22, 2007 at 13:38](#)

As Tom points out quite eloquently, there is an assumption the underlying virtual-world population is a lognormal stochastic process.

I think the related pdf and cdf curves can be safely assumed.

We're really just arguing about the sigma of the lognormal pdf, I suspect, in regards to curve fit.

Posted by: [randolfe](#) | [Thursday, February 22, 2007 at 13:46](#)